Essays on Banking and Monetary Policy in the Presence of Islamic Banks

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Declaration

I declare that the thesis is my own work and has not been submitted for a degree at another university.

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Abstract

This thesis consists of two chapters and aims to investigate the presence Islamic banks in Indonesia in the context of stability and monetary policy transmission mechanism. The first chapter compares bank stability, in particular profit stability, in Islamic versus conventional banks amid business cycle fluctuations. The unique characteristics of Islamic finance principles hypothetically involve different financial structures and provide stability for banks that comply with them. Using monthly bank-level data with comparable banks across the two types, I investigate the dynamic responses of individual banks to business cycle fluctuations. The dynamic estimation results show that the profits of Islamic banks' are more stable than those of conventional banks in the short run, yet generally indicate no significant difference in the long run. However, the inclusion of the loan-to-asset ratio removes the remaining short-run differences. I check for robustness by estimating the static relationship between individual bank's profits and the average profitability of the total banking industry, and the outcomes support the no-difference results. The second chapter compares the monetary transmission through Islamic and conventional banks by investigating how a particular bank asset portfolio, which corresponds to their type from being conventional or Islamic, determines the equilibrium rate of return on loans and on deposits which in turn affects their loans and net-borrowing from the central bank. Certain application of Islamic finance principles leads to a marked difference in Islamic banks' assets portfolio which corresponds to a consistently higher loan-to-asset ratio in comparison to conventional banks. I test a set of predictions conveyed by the theoretical model using a panel of individual bank data. The results turn to be highly dependent on how well the two types of banks are segregated from each other, in which slack segregation may dissipate the potential differences. In particular while initially the results show no significant difference in responses of the two types of banks to the central bank policy rate, excluding Islamic windows from the sample allow the potentially difference to be more apparent and significant. Overall, the possibility that both types of banks may after the same pool of consumers exposes them to compete with banks from the other type, generating arbitrage opportunities that drive prices toward equality across types and impede the potential difference across banks.

Introduction

This thesis aims to investigate the presence of Islamic banks in a country that has a dual banking system, i.e. a system where conventional and Islamic banks operate side by side within the economy, in the context of stability and the monetary policy transmission mechanism.

Islamic banks are banks that comply with the prescription in *Sharia* law concerning its operation, which is based on the Quran and the *Hadith* – the authentic tradition. The general principles of Islamic finance could be summarized, but not limited, to the following: prohibition of interest, thus encouraging the profit and loss sharing mechanism; prohibition of contractual uncertainty; and prohibition of gambling, speculation or excessive risk-taking in carrying out transactions (Askari *et al.*, 2010). Islamic principles also promote a "*materiality*" aspect, requiring the direct linking of financing with the underlying asset so that any "*financing activity is clearly and closely identified with the real economy*" (Iqbal and Mirakhor, 2007). In its operations, according to Askari *et al.* (2010), the concept of Islamic banking includes two types of banking activities: (i) safe keeping and payment activities and (ii) equity-based investment activities. The first is basically 100% reserve banking, where deposits remain highly liquid and where checking services are perfectly available. In the second, the depositor is, in essence, purchasing equity in the bank, and the bank itself has an equity position in the borrower's business in which Islamic banks directly participate in a risk-taking process through trade, leasing and other productive investments in the real sectors.

In a more general context, the concept of Islamic banking activities resembles proposals for monetary reform known as the Chicago Plan, initiated in Simons (1933, 1948) and revived in Benes and Kumhof (2012); and, more recently, the Limited Purpose Banking

(LPB) proposed in Kotlikoff (2011) and Chamley *et al.* (2012). Both proposals emphasise the necessity of 100% reserve requirement and the importance of eliminating leverage from the financial intermediaries in achieving a stable and well-functioning financial system.[1] While those two proposals are not yet implemented, many countries have partially adopted the Islamic banking concept within their dual banking system. Nevertheless, the concept of *Sharia*-compliant product and services of Islamic banking varies a great deal across countries (Beck *et al.*, 2013). Many also argue that Islamic banks' day-to-day operations are diverging from the initial concept above, diminishing the gap between Islamic and conventional banks (see among others: Chong and Liu (2009); and Cevik and Charap (2011)).

This thesis examines Islamic banking practices in the context of stability and the monetary policy transmission mechanism in the case of Indonesia in two chapters. While the first chapter directly assesses stability in terms of profit stability, the second chapter does this by evaluating banks' responsiveness to monetary policy.

The first chapter focuses on profit stability of Islamic and conventional banks by measuring the sensitivity of bank profits to fluctuations in the business cycle using dynamic panel estimation of Blundell and Bond (1998). Based on the above concept, Islamic banks' profitability is more stable than conventional banks, since Islamic banks have the ability to adjust their liability in accordance with their assets performance. The results show that Islamic banks have slightly better, yet statistically significant, stability in the short-run in comparison to conventional banks. Nevertheless, this difference is not large enough to deliver any difference in profits variability across the two types of banks in general.

The second chapter provides theoretical and empirical studies on how the specific transmission mechanism of monetary policy works in Islamic and conventional banks within a dual banking system. In particular, how a certain bank characteristic, which corresponds to their type as either conventional or Islamic, determines the equilibrium rate of return on loans and on deposits, which, in turn, affects their loans and net-borrowing from the central

[1] LPB is actually a proposal that designated to reform not just the banking system but also all financial intermediaries such as insurances, hedge funds, etc. (Kotlikoff, 2011).

bank in response to the policy rate. This characteristic is the loan-to-assets ratio, which, due to the "materiality" aspect of Islamic finance explained above and the limited sharia-compliant financial products that are available in the market, is consistently higher in Islamic banks in comparison to conventional banks. The empirical work tests a set of predictions using difference-in-difference method and initially finds that there is no-difference in responses of the two types of banks to the central bank policy rate. However, when Islamic windows are excluded from the sample, the results show significant differences in the response of rate of return on loans and net-borrowing from the central bank in response to the policy rate.[2] In particular, in support for the theoretical framework, monetary policy that works via conventional banks is stronger than Islamic banks.

Overall, these studies show that the dual banking system may inevitably drives both types of banks to somewhat share their customer base, generating arbitrage opportunities that may drive prices toward equality across types. This is particularly stronger for Islamic windows where the two types of banks are closely inter-correlated to each other. While empirical results of the second chapter show that Islamic full-fledged may relatively have more limited exposure to conventional banks, it does not necessarily imply that they are not in competition with conventional banks. This is reflected in the first chapter, that only deals with Islamic full-fledge banks, which suggests that there is a possibility that some Islamic banks may partly depart from the initial concept of an equity-based system by smoothing out the payment to their depositors in order to sustain their competitiveness with conventional banks. Nevertheless, future research is needed to further investigate this income smoothing possibilities. Further, the empirical results in the second chapter confirm the similar evolution of rate of return on deposits across the two types of banks, which may also indicate that the two types of banks are in competition with each other. As one of the consequences, though Islamic banks tend to be more stable in term of their responsiveness to monetary policy, yet they generally could not provide better stability in term of their profitability in comparison to their conventional counterpart.

[2] Islamic window are units of conventional banks that offer Islamic banking services.

Chapter 1 Bank Profitability and Business Cycles: Are Islamic Banks more Stable? Evidence from Indonesia

1.1 Introduction

Macro-prudential analyses require thorough knowledge of how banking sector profitability is related to business cycles (Albertazzi and Gambacorta, 2009); this is especially true for a bank-based economy. The banking sector's soundness and stability are closely determined by its profitability and the structural factors affecting it (Demirguc-Kunt & Detragiache, 1998). In particular, bank balance sheets can deteriorate when the rate of return on the asset side, which is closely related to overall business performance through the economic performance of bank borrowers, falls short of the rate that must be paid on the liability side. Hence, from this point of view, if banks could adjust their liability according to their assets performance, hypothetically the system would be inherently stable and less sensitive to business cycle fluctuations.

Theoretical studies in Islamic banking, such as those of Khan and Mirakhor (1987, 1991) and Askari *et al.* (2010), assert such flexibility.[3] In theory, there are several marked differences in Islamic finance compared to conventional finance. What follows are the basic

[3] The theoretical Islamic banking is not the only concept who offers flexible as opposed to fixed predetermined return in banking products. Simons (1948) with his proposal the Chicago Plan, revived recently by Benes and Kumhof (2012); and most recently the Limited Purpose Banking in Kotlikoff (2011) and Chamley *et al.* (2012) are among the proponent of equity-based banking system.

principles of Islamic finance, according to Iqbal and Mirakhor (2007). First, Islamic finance principles prohibit interest-based payments. Any predetermined rate tied to the maturity and the principal amount, so that it is guaranteed regardless of the performance of the investment, is prohibited. Second, Islamic law encourages profit making, for it represents successful entrepreneurship and the creation of additional wealth. Islamic finance requires borrowers and lenders to share rewards and losses in an equitable fashion, and this process of accumulating and distributing wealth in the economy represents true productivity. Third, Islamic finance principles promote a "materiality" aspect that requires financing to be associated directly with the underlying asset, in which "the financing activity is clearly and closely identified with the real sector activity". Lastly, hoarding is discouraged and transactions featuring extreme uncertainty or gambling with excessive risks and the financing of specific illicit activities are prohibited. With reference to stability, Khan and Mirakhor (1987) and Askari *et al.* (2010) emphasise the usage of the profit and loss sharing mechanism on both sides of the bank balance sheets, especially with respect to the liability side, as a device to ensure banks' financial stability in general or profit stability in particular, albeit departing from any potential problems of moral hazard.

In practice, however, many argue that, nowadays, Islamic banks' day-to-day operations are diverging from these initial principles, albeit implicitly. Some of the emerging financial products of the Islamic banking industry closely resemble products of conventional banking, diminishing the gap between the two systems. Empirical studies by Chong and Liu (2009) and Cevik and Charap (2011), among others, on Malaysian Islamic banks find that Islamic deposit – or equivalent – rates are not interest-free, but closely pegged to conventional deposit rates. On the asset side, Khan (2010) finds that, for a sample of large Islamic banks across several countries, only a negligible portion of Islamic banks' financing is actually based on a profit and loss sharing mechanism. These sorts of findings may indicate an impediment to the inherent stability that theory predicts. Whether there are

differences in profit stability across business cycle fluctuations between Islamic and non-Islamic banks is an empirical question.[4]

In a small but growing literature on Islamic banking, some studies have already sought to analyse the financial stability, in particular insolvency risk, of Islamic banks and tease out any differences in comparison to its conventional counterparts.[5] Cihak and Hesse (2010), Beck *et al.* (2013), and Abedifar *et al.* (2013) use cross-countries' bank-level data of OIC members to assess and compare the financial stability of Islamic banks versus non-Islamic banks. While Cihak and Hesse focuses its work solely on assessing insolvency risk, Beck *et al.* and Abedifar *et al.* do this as a part of another research focus, such as efficiency and business models for the second study, and credit risk, interest rate risk and religious rent for the third study. All these three studies employ the z-score as a measure of bank stability or insolvency risk.[6] In general, they find that, controlling each country's characteristics, there is no significant difference in terms of stability between Islamic and non-Islamic banks. If the analysis takes into account bank size, Cihak and Hesse (2010) finds that small Islamic banks tend to be more stable than their conventional counterparts, while the contrary applies for large Islamic banks. Similar results are also found by Abedifar *et al.* (2013) for small banks, but they do not discover any difference for large banks. As for Beck *et al.* (2013), they do not encounter any significant difference in stability across all specifications.

In this paper, we follow Albertazzi and Gambacorta (2009) in using one of the components of the z-score, namely profitability, as the dependent variable in measuring bank stability in facing fluctuations of the business cycle. There are other factors which can serve as financial stability indicator such as for example liquidity and loan quality. However, we focus on profitability because it is one of the main indicators of financial soundness in banking (see Financial Soundness Indicator, IMF (2006)) and some studies find that bank

[4] I use the term non-Islamic and conventional banks interchangeably; however the empirical sections merely use the term non-Islamic banks.
[5] Abedifar *et al.* (2013) provides a summary of empirical literature on Islamic banking.
[6] The z-score, theoretically developed by Boyd and Runkle (1993), measures the probability or distance to default, combining profitability, leverage and volatility. Higher value of z-score implies a lower probability of insolvency. It has been used quiet extensively in the recent literature; see e.g. Laeven and Levine (2005), Demirguc-Kunt and Huizinga (2010) and Houston et al. (2010).

profitability is an important predictor of banking sector vulnerability (Demirguc-Kunt and Detragiache (1999), Cihak and Schaeck (2007) and Navajas and Thegeya (2013)). Adverse economic condition leads to deterioration of loans quality, increasing non-performing loans and credit losses, which ultimately worsen banks' profits. We further compare the stability of Islamic versus non-Islamic banks by measuring the sensitivity of bank profits to the business cycle. The more sensitive bank profits are to business cycle fluctuations, the more likely it is for profitability to be unstable. This mode of analysis stems from the prediction that banks' ability to adjust their liability in accordance with their assets performance (through profit and loss sharing mechanism in the case of Islamic banks) influences the stability of their profits. Based on this, as suggested by Khan and Mirakhor (1987) and Askari *et al.* (2010), Islamic banks' profitability is more stable than non-Islamic banks. The resulting empirical framework allows prediction of factors affecting bank profitability, as well as comparison of sensitivity to the business cycle across the two bank groups. By so doing, the empirical framework also partially serves as a test for the implementation of profit and loss sharing mechanism of Indonesian Islamic banks.

There are quite a range of studies in modelling bank profitability (for cross countries studies, see Bourke, 1989; Molyneux and Thornton, 1992; and, more recently, Goddard *et al.*, 2011; Athanasoglou *et al.*, 2008, for the Greek case; Dietrich and Wanzenried, 2011, for the Switzerland case), whereas only a dearth of studies exist on Islamic banks; to name a very view is Bashir and Hassan (2003) for a cross-countries analysis. Most of these studies use macroeconomic and business cycle variables as control variables. There are also studies that explicitly investigate the relationship between bank profitability and the business cycle: Bikker and Hu (2002), and, more recently, Albertazzi and Gambacorta (2009) empirically assess the cyclicality of bank profitability by investigating the way components of bank profitability relate to the business cycle.

This paper attempts to compare the fluctuations – or stability – of Islamic and conventional banks' profitability by investigating its sensitivity to the business cycle fluctuations. To our knowledge, it is the first paper to provide such a comparison from this

angle. The novelty of this paper lies in its ability to simultaneously model Islamic and conventional banks' profitability, as well as comparing its stability amid fluctuations in the business cycle. We utilize Indonesian bank-level data for monthly periods during 2007:1-2012:10. To investigate the dynamic response of individual bank profitability to business cycle fluctuations, we employ a dynamic panel technique which allows estimation on short-run and long-run responses simultaneously. We check for robustness by running the same regression on two sample sets, one includes all banks and the other only includes banks with comparable in terms of their ownership structure and assets size across types, Islamic and conventional. The dynamic results show that the profitability of Islamic banks is more stable than conventional banks in the short-run and this result is robust across sample sets. Though the short-run difference in profit stability between Islamic and conventional banks is statistically significant, yet the magnitude is fairly small. The inclusions of bank-specific characteristics, such as size, credit risks and capital, do not alter the results. However, the inclusion of the loan-to-asset ratio removes the remaining short-run differences. As there is evidence that a bank with a higher value of this particular characteristic has more stable profitability, which Islamic banks inherently possess, this implies that the loan-to-asset ratio may well explain the perceived short-run difference between the two groups. These dynamic results are even stronger for the sample set of banks with similar ownership structure and assets size. For the final robustness check and to grasp an overview on fluctuations of profitability across the two banking groups, we estimate the static relationship between individual bank profitability and the average profitability of the total banking industry. We find no evidence of differing fluctuations between the two bank groups across sample sets, which supports the no-difference results of the first stage's long-run estimations. Thus, in general, we could not observe significant difference in fluctuations of Islamic and non-Islamic banks profitability.

The paper is organized in the following manner. Section 2 briefly describes Indonesian dual banking industry. Section 3 explains the methodology and outlines the data. Section 4 presents the empirical results. Section 5 concludes the paper.

1.2 A Brief Overview of the Indonesian Dual Banking Industry

This section firstly outlines overall performance, details some facts about the Indonesian banking sector, and then briefly describes the development of the country's Islamic banking industry.

The banking industry dominates the entire financial sector of Indonesia, whose assets account for 80% of the sector's total assets. Nevertheless, the financial sector assets account for around only 85% of total GDP, which reflect relatively shallow financial sector inclusions. In terms of contribution to the economy, the total loans of the industry only account for around 35% of GDP, while internal funds remain the main source of funds for firms' investment activities. This low contribution is due to relatively underdeveloped and shallow financial markets in Indonesia. In regard to the recent widespread financial crisis of 2008, though the impact to Indonesia was fairly limited, the banking sector endured a swift period of liquidity shortage in August, when the ratio of liquid instruments held by banks to non-core deposits reached its lowest point of around 85%,[7] and the financial stability index (FSI) reached its highest point in November of 2.43.[8] In spite of this, the total bank loans by that time were still growing quite high for annual growth more than 30%. In terms of the structure of the industry, the banking sector is dominated by government-owned banks, in which five of the top banks account for around 45% of market share. Following deregulation in 1998, triggered by the banking crisis, foreign ownership increased dramatically for up to 30% changes in total market share.

The Indonesian banking sector adopts a dual system, in which conventional and Islamic banks operate side by side within the economy. The first Islamic bank was established in 1992. In order to encourage the development and network expansion of the Islamic banking industry, the government amended the Banking Act in 1998, which allowed conventional banks to open an Islamic window, a unit that provides Islamic banking services. It further strengthened the business by amending the Central Bank Act in 1999,

[7] Basically, a ratio less than 100% indicates that a bank does not have adequate liquidity to meet deposit withdrawals.

[8] The FSI in Indonesia represents financial sector stability, which includes banking, bonds and stock markets. The maximum indicative limit is level of 2.00. In the economic crisis of 1997/98, the index topped at 3.23.

allowing monetary control using instruments that are based on Islamic principles. To further boost the industry, a dedicated act for Islamic banking was issued in 2008, in which the existence of Islamic windows is regarded as temporary, and shall be completely spun-off to fully-fledged Islamic banks by adding more capital up to a certain level. In addition, besides establishing new Islamic banks, one can convert a conventional bank into an Islamic bank, but not the other way around. During the sample period of this paper, there are cases of such conversions, which are commonly carried out by the acquisition of smaller banks by conventional banks then converted into Islamic banks.

The inclination of people to employ Islamic banking services is stimulated by the issuance of a verdict on the prohibition of interest by the council of the country's Islamic scholars in 2003. Nonetheless, though the Indonesian population is predominantly Muslim, the Islamic banking sector still accounts for just a very small portion of the banking industry, with total assets accounting for around 5% of the total industry's assets, though there is rapid annual growth of more than 50%-60% on average. One of the conditions that commonly cited as an explanation for low market share is the dearth of product innovation in the Islamic bank portfolio. Compliance with *Sharia,* or Islamic, principles may hinder financial product innovation and, in turn, hamper Islamic bank competitiveness. In addition, there are differences in the interpretation of *Sharia* across Muslim countries.

1.3 Methodology and Data

1.3.1 Methodology

To compare Islamic and non-Islamic banks' profits sensitivity with the business cycle fluctuations, the following empirical model is applied to a panel of individual Islamic and non-Islamic banks in Indonesia:

$$\pi_{ijt} = c + \left(\beta + \lambda NI_j + X'_{ijt}\theta\right)Z_t + \delta NI_j + X'_{ijt}\phi + \varepsilon_{ijt} \;,\; \varepsilon_{ijt} = \alpha_i + u_{ijt} \quad (1.1)$$

where π_{ijt} is the profitability of bank i from group j, i.e. Islamic or non-Islamic, at time t, c is a constant term, NI_j is a non-Islamic dummy which is equal to 1 for non-

Islamic banks and 0 for Islamic banks, X_{ijt} is a matrix of bank characteristics as control variables, Z_t is the business cycle variable and ε_{ijt} the disturbance, with α_i the unobserved bank-specific effect and u_{ijt} the idiosyncratic error. Equation (1) is a one-way error component regression model, where $\alpha_i \sim \text{IIN}\left(0, \sigma_a^2\right)$ and independent of u_{ijt}, which may have bank-specific patterns of heteroskedasticity and serial correlation that are uncorrelated across banks.

The effect of business cycles on profitability is captured by the sum of parameters β and θ for Islamic banks and by the sum of parameters β, θ and λ for non-Islamic banks. In general, we expect procyclicality in bank profitability. The interaction terms of the components in the bracket with the business cycle variable are intended to capture how banks from the two groups, Islamic and non-Islamic, and with different characteristics, may respond differently to business cycle fluctuations. In particular, the interaction with NI_j is the main variable of interest in which any difference between variability and or stability in profitability of the two groups is captured by parameter λ. The interpretation of which group is the one with more stable profitability depends on the sign and magnitude of these estimated parameters. Non-Islamic banks would have more unstable profits if both parameters have the same sign, or if the absolute sum of the two is greater than the absolute value of β.[9] The straightforward intuition is that profitability of a bank with a larger response to the business cycles is more volatile than a bank with a smaller response.

According to the theoretical analysis of Khan and Mirakhor (1987) and Askari *et al.* (2010), a non-Islamic bank is expected to be more unstable in comparison to its Islamic counterpart based on a condition that the latter treats deposits similarly with shares or equity, in which depositors would not be guaranteed a predetermined nominal return; they would receive a share of the bank profit instead. In the Khan and Mirakhor model, a shock to real income in both types of bank may deliver short-run differences between the two. In particular, Islamic banks do not necessarily need to resort to the liability-management technique of raising interest rates to bid on deposits, a short-run process that they claim

[9] The empirical results in the next part report the implied response of non-Islamic bank profits separately.

would lead to instability. In sum, theoretically shocks in the assets value would be passed through to the liability side, leaving the system stable. Based on this argument, the expected sign and magnitude of the estimated parameters $\hat{\beta}$ and $\hat{\lambda}$ would be those which imply more unstable profitability of a non-Islamic bank. Nevertheless, the stability of bank profitability may well be influenced by their own individual characteristics, which may or may not be related to them being Islamic or non-Islamic. For this reason, model (1.1) also includes bank characteristics as possible explanatory and control variables.

The same interpretation of parameter λ also applies to θ on the interaction of bank characteristics with the business cycle variable, which explains how different bank characteristics may respond differently to the business cycle. Though our main objective is to capture the stability and volatility of bank profitability through fluctuations in the business cycle, model (1.1) provides this by estimation of the level of profitability rather than directly of its volatility.[10] By so doing, not only does it preserve the available time observation, it also allows estimation of the effect of bank characteristics on volatility of bank profitability through θ and on level of profitability through ϕ, based on the assumption that the business cycle variable Z could capture most of the variability of bank profitability. While other studies in the literature do not generally focus explicitly on the effect of the business cycle on bank profitability due to its cross-country and short time dimension nature, the available observation and frequency of this study allows more elaboration, in particular the ability to measure the short-run effect alongside the long-run effect.

The bank characteristics included in the estimation are (i) capital, (ii) size, (iii) credit risk, and (iv) loan-to-asset ratio. The latter may represent bank product diversification and also signals its liquidity condition. The first characteristic, *capital*, is measured by ratio of equity to total assets: the effect of capital on bank profitability is ambiguous. While capital can positively affect bank profitability through reducing the cost of external funding as capital may reflect lower risks, it may also negatively affect bank profitability through conventional risk-return hypothesis where banks with a lower capital ratio, and therefore

[10] For robustness check, OLS estimation on standard deviation of individual bank profitability is also undertaken.

more risky, deliver higher returns in comparison to better-capitalized banks. Thus, the net effect of capital on bank profitability cannot be anticipated theoretically. The effect of capital on volatility of profitability is directly associated with its capacity as a proxy for risk, in which higher risk implies greater volatility. The second characteristic, *size*, is measured by ratio of a bank's total assets to the average of industry's assets. Generally, most studies suggest that bigger banks are able to generate higher profits, though this may not be in a linear manner as in Athanasoglou *et al.* (2008), and some relate size to capital, then, in turn, to profitability, as seen in Bikker and Hu (2002) and Goddard *et al.* (2004). The effect of size on the volatility of profitability is not straightforward, since there is no direct relation between bank size and its riskiness. However, we could follow previous studies by relating bank size to its capital and, in turn, to its risk position. Third, *credit risk*, measured by ratio of loan-loss provisions to total loans. This theory expects negative effects of credit risk on profitability, as lower credit quality reduces a bank's ability to generate greater profit. The effect of credit risk on volatility is straightforward, as more risk is associated with higher volatility. Last, the loan-to-asset ratio is one of the measures for liquidity risk and product diversification.[11] Again, a conventional risk-return hypothesis expects a higher loans-to-asset ratio, hence higher liquidity-risk, delivering a higher return and higher volatility. On the other hand, a higher loan-to-asset ratio reflects lower product diversification, and suggests that a higher product mix enables more stable revenue. Thus, according to this view, we expect a positive relation between the loan-to-asset ratio and bank profitability, and a negative relationship with its volatility. Overall, the effect of the loan-to-asset ratio is ambiguous.

While the literature mainly explores the effect of bank characteristics on bank profitability, it rarely directly examines the effect of these characteristic on stability or sensitivity of bank profit on the business cycle.[12] The empirical model specification in model

[11] Another common measure of liquidity risk is ratio of liquid assets such as cash, bank deposits and securities to total assets, as in among others Bourke (1989) and Molyneux and Thornton (1992).

[12] Some of these studies look at the effect of product diversification on profit stability in a similar way with analysis in non-financial firms. Others examine bank stability based on probability of default or z-score mentioned previously.

(1.1) allows estimation of the effect of these characteristics on both – bank profitability and its volatility across time in a single equation. In order to observe the partial effect of each particular characteristic on the estimated parameter $\hat{\lambda}$, and as a parsimony model is preferred to a more general one, the inclusion of bank characteristics is done by introducing one characteristic at a time.[13]

Due to the monthly data frequency and relatively long period of observation, the time series component of the estimation needs to be treated carefully for the model to be correctly specified. With this in mind, and supported by the literature of persistence in bank profits (see, among others, Berger *et al.* (2000), Goddard *et al.* (2011) and Athanasoglou *et al.* (2008)), model (1.1) is augmented to dynamic form as the following:

$$\pi_{ijt} = c + \sum_{l=1}^{L} \rho \pi_{ijt-l} + \sum_{l=0}^{L} \left(\beta_l + \lambda_l NI_j + X'_{ijt}\theta_l\right) Z_{t-l} + \delta NI_j + \sum_{l=0}^{L} X'_{ijt-l}\phi_l + \varepsilon_{ijt} \quad (1.2)$$

where π_{ijt-l} are the lags of bank profitability, while the explanatory variables also enter the equation with the necessary number of lags based on a statistical test, except for the NI dummy. Profit persistent implies parameter ρ in model (1.2) to be non-zero, thus the model exhibits dynamic panel which includes lagged of dependent variable.

Though ignoring serial correlation does not lead to inconsistency, it would impair efficiency, bias the standard error, and thus inflate the resulting t-statistics. On the other hand, the inclusion of the lagged dependent variable has its own drawback through incorrectly "dominate" the regression by obscuring the actual relationship (Beck, 2005). For this reason, it is strongly suggested that a model with a lagged dependent variable is done based on theoretical consideration or valid checks of the residual structure that leads to the necessity of dynamic estimation. Based on this, to check the validity of using the dynamic model (1.2), the static model (1.1) is first estimated to see whether the resulting residuals are serially correlated using test for first order serial correlation in linear fixed (or random)-effects panel-data by Wooldridge (2002). The test for serial correlation shows that the null of no serial correlation is strongly rejected with F-statistics and p-value equal to 45.045 and

[13] Having parsimonious model is one of the ways in avoiding problem of too-many instruments explained below.

0.000, respectively. Further, in order to find the appropriate dynamic specification, test for stationarity on each variable are undertaken by using a unit-root test for the unbalanced panel by Im, Pesaran and Shin (2003). The test results (Table A1.1 in the Appendix 1) show that ROA and all the control variables are stationary in level and that the maximum lag is around 1. The business cycle variables, explained in the next section, are differenced-stationary; thus we use the percentage of monthly growth in the estimation. These results lead us to use an autoregressive distributed lags (ADL) model of order (1, 1). This particular model is very convenient as it provides estimation of short-run and long-run effects on stationary data in a single equation Error Corrections Model (ECM). Thus, model (2) can be rewritten as the following:[14]

$$\pi_{ijt} = c + \rho\pi_{ijt-1} + \sum_{l=0}^{1}\left(\beta_l + \lambda_l NI_j + X'_{ijt}\theta_l\right)Z_{t-l} + \delta NI_j + \sum_{l=0}^{1} X'_{ijt-l}\phi_l + \varepsilon_{ijt} \qquad (1.3)$$

In estimating model (1.3), the fixed effect method, commonly used in the literature around this topic, gives rise to dynamic panel bias or 'Nickell bias' (see Nickell, 1981), especially for small T and large N panel, and inconsistent estimates (see Baltagi, 2001). To obviate such problems, model (1.3) is estimated using the dynamic panel estimation method suggested by Blundell and Bond (1998), which was initially outlined in Arellano and Bover (1995). This method offers greater efficiency than the earlier method by Arellano and Bond (1991) (see Roodman, 2009), particularly in the case of the dependent variable, which is close to random walk.[15] The method uses lagged values of dependent variable in levels, as well as in differences in instruments. It also allows possible forms of endogeneity of the control variables, such as capital and size, by applying the same technique used in instrumenting the lagged dependent variable. [16] In order to get the right specification, we apply Hausman test for each model with a control variable. The test is based on the

[14]As a simple example for the baseline estimation which does not include any control variable, the difference in short-run effect of business cycle to bank profitability is λ_0 and the long-run effect is $(\lambda_0 + \lambda_1)/(1-\rho)$. The same rules apply for other parameters.

[15] The next section on empirical results shows that the first lagged of the dependent variable in (2) is indeed have high value with $\hat{\rho}$ up to 0.9.

[16] Garcia-Herrero *et al.* (2009) suggests that banks with higher profitability may more easily increase their capital and also may be more able to expand their size.

assumption that the correct specification for the control variable is full-exogeneity. Treating the control variable as predetermined is consistent, whether or not the assumption is true, and treating it as exogenous is only efficient and consistent if, and only if, the assumption is true.

Nevertheless, caution should be exercised when determining the number of lags used as instruments. The difference and system GMM approaches are prone to too many instrument problems (see Roodman, 2009), in which a longer time period aggravates the problem of instrument proliferation. The large number of instruments may fail to obliterate their endogenous components, which leads to a bias estimated coefficient toward those of non-instrumenting estimator. One of the symptoms of this too-many instrument problem is the implausibly high p-values of 1.000 of the Hansen test (Bowsher, 2002). One of the ways to avoid such a problem is that, as an arbitrary rule of thumb, the number of instruments may not exceed the number of individuals in the panels. For this reason, we restrict the lags range used and collapse the instrument matrix. The number of instruments used in estimation is reported alongside the Hansen test p-value.

The empirical work includes two parts of analysis. The first part is intended to investigate the dynamic of individual bank profitability using business cycle variables which come from outside the banking sector for the variable Z_t; thus, they may entail different short-run and long-run effects. We employ the dynamic specification in (1.3), which allows estimation of short-run and long-run responses simultaneously. The second part, as robustness check, estimates the static model (1.1). This time the average banking sector profitability is used for Z_t variable. Since the relationship between individual bank profitability and the average profitability of the total banking industry is mostly identical across time, using static specifications as in (1.1) is appropriate, though may not be efficient. This estimation is intended to investigate the general comparison of profits stability across the two banking groups during the regression period. However, the small number of Islamic banks in the sample may weaken the significance or the statistical power of this static estimation.

We also do another robustness check of the results with respect to the selected sample. Beck *et al*. (2009) finds that, using banks in Germany as the sample, government banks are more stable than privately owned banks. On the other hand, Iannotta *et.al* (2007) on cross-countries European banks, suggests that government banks have poorer loan quality and higher insolvency risk than other types of banks. To account for these, we estimate the same regressions of each part for two sample sets with different bank ownership or institutional types. In particular, for the first sample (Sample1) we include all banks, while for the second sample (Sample2) we exclude government banks and regional development banks.[17]

1.3.2 Data

The data source is the monthly bank reports to the central bank of Indonesia (Bank Indonesia, 2007-2012b), which is an obligatory report for every bank. The period covered is from January 2007 to October 2012, i.e. seventy periods. The sample considers 138 commercial banks, of which 11 are Islamic banks.[18] This data set comprehensively includes all banks which are operating in the period of observation. For cases of mergers and acquisition, the newly formed bank has the same identity number with the main bank. For cases of conversions, the same number of identity is used but with different values in the NI dummy variable. During the observation periods, 7 non-Islamic banks converted to Islamic banks and 1 Islamic window spun-off to full-fledged Islamic bank. The non-Islamic banks consist of 5 government banks, 26 regional development banks and 101 private banks, while the Islamic banks are all privately-owned banks. The exclusion of government and regional development banks from Sample1 leaves the non-Islamic banks and Islamic banks to be more comparable in term of ownership structure since now, in Sample2, both types solely consist of privately-owned banks. The panel is unbalanced since there are some bank

[17] For government banks the ownership is 100% central government while for regional development banks the majority of shareholders is the regional government.
[18] For technical reason, the Islamic banks in the sample only consider full-fledged Islamic bank and excludes Islamic windows or business unit of non-Islamic banks.

closures during the period of observations, consisting of 8674 observations for Sample1 and 6472 observations for Sample2.

Following the usual practice in the literature the profitability variable is represented by the ratio of profits to assets, i.e. the return on assets, *ROA*, (Golin, 2001), measured by the annualized profit before tax divided by average assets in percentage value. The possible variability of the denominator may obscure the actual variability of profits in the numerator. Therefore, for additional robustness check, we also estimate the baseline dynamic model with the annualized profits as dependent variable for both Sample1 and Sample2 (Table A1.4 in the Appendix 1).

There are some issues regarding the monthly data which caused the calculated *ROA* in January to exhibit far larger absolute values than in other periods for most of the banks. This phenomenon, known as the "January-effect" (Bank Indonesia, 2006a), could be initiated by several aspects that affect the calculated *ROA* through bank total assets, or, more directly, through bank profits which are outlined in the following. The effect that works through bank total assets is that, in general, banks experience a drop in their deposits and total loans at the beginning of a year. The drop in deposits is due to a bank's high dependency on the realisation of government spending, which reaches its lowest level in January, particularly for government banks and in turn affects the whole industry since these government banks are account up to around 40% of the whole industry.[19] On the other hand, the drop in loans is due to a bank's business plan, where January is often reserved for internal consolidation causing lower loans decisions. Largely, small banks are more prone to these drops, which may actually lead to a loss in that particular month. Equally important, the drop in bank loans is also due to lower deposits as the main source of funds for the supply of loans. The effect that possibly works through bank profits is related to another "January-effect" that occurs in the financial market and which mainly affects those banks with high trading activities. [20,21] Hence, the January data does not govern or predict data for the remaining

[19] See the Outlook of Indonesian Islamic banks 2012 (Bank Indonesia, 2012) for January effect as an explanation of a drop in Islamic banks deposits during January 2011.
[20] "A seasonal anomaly in which stock's prices increase in the month of January more than in any other month" (http://en.wikipedia.org/wiki/January_effect).

months in a year. Based on these conditions, the January data is corrected by taking the average of the months preceding and following January. These corrections are identically applied to both groups, Islamic and non-Islamic banks.

The business cycle variable is represented by the industrial production index, which measures changes in real production of large- and medium-scale non-oil manufacturing firms in Indonesia. This index is available in monthly periods and based on the monthly survey by a non-departmental government institution (Statistics Indonesia, 2012). The manufacturing or industrial sector contributes about a quarter of total Indonesian *GDP*, and around 20% of the total loans of the Indonesian banking industry are dedicated to this particular sector. This sector is highly sensitive to market conditions and consumer demand, especially private investment, which makes the index not only reflecting the manufacturing sector but also a good proxy for overall economic performance (Bank Indonesia, 2010). The index is often used by the central bank as one of the indicators for the real sector's activities in formulating monetary policy (Bank Indonesia, 2006b). In addition, another proxy for a business cycle variable that is also considered is the total domestic consumption of cement in real value, which roughly represents the construction sector. However, this sector only accounts for around 6% of total *GDP* and around 5% of the total bank loans. Nevertheless, cement sales' monthly data is also commonly used as an indicator for tracking Indonesian domestic demand.

Table 1.3.1 reports the descriptive statistics for the variables used in the estimation and test the difference in mean values of non-Islamic and Islamic banks in both sample sets, Sample1 and Sample2. On average, the *ROA* of non-Islamic banks is significantly higher than those of Islamic banks and with bigger variations in both sample sets. The coefficient-of-variations, i.e. the ratio of mean to standard deviation, of non-Islamic banks' *ROA* are 1.615 and 2.402, for Sample1 and Sample2 respectively, both are larger than 1.349 of Islamic banks'. These coefficient-of-variations imply that non-Islamic government and regional banks' variation of *ROA* is less than the privately-owned ones, and that in both

[21] See Nagasastra and Utami (2012) who investigate the existence of the January-effect in the Indonesian capital market.

sample sets Islamic banks tend to have less variation of *ROA* in comparison to non-Islamic banks. In addition, a simple regression on 12 months standard deviation of *ROA* also shows that non-Islamic banks tend to have higher volatility of *ROA*, in particular in Sample2 (Table A1.2 in the Appendix 1).

Table 1.3.1 Summary statistics

	Non-Islamic[a)]				Islamic[b)]	
	Sample1		Sample2			
Variables	Mean	Std.dev	Mean	Std.dev	Mean	Std.dev
π (ROA)	2.30***	3.71	1.69**	4.06	1.25	1.69
CAR	17.38*	19.49	19.96	21.98	18.69	15.58
LLP	3.55***	6.78	3.67***	7.84	2.26	1.94
LAR	56.66***	16.77	57.59***	17.59	81.66	24.49
SIZE	1.04***	2.61	0.61***	1.05	0.37	0.42
	Number of small banks / Total banks in group					
SMALL	70/128		57/96		7/11	

Description	
π (ROA)	Ratio of profits before tax to average assets (%)
CAR	Ratio of total equity to total assets (%)
LLP	Ratio of loan-loss provisions to total loans (%)
LAR	Ratio of total loans to total assets (%)
SIZE	Ratio of assets to the average of industry's assets
SMALL	Small bank if total assets < IDR5000 billions

Note: a) Non-Islamic banks consist of government, regional and private banks; b) Islamic banks are all private banks. Sample1 consists of all banks, while Sample2 exclude government and regional banks. The difference between mean value of Non-Islamic and Islamic banks that is significant at 1%, 5% and 10% are marked with ***, **, and * respectively.

In terms of assets size, Islamic banks on average are smaller than non-Islamic banks. The difference is more apparent in Sample1 since most of the government banks are large banks. Though the mean tests of *SIZE* variable show significant differences between non-Islamic and Islamic banks, the difference is relatively smaller in Sample2. If we categorize banks as small for assets size less than IDR 5000 billion, the ratio of small banks to total banks of non-Islamic banks in Sample2 is around 60% similar with the number of small banks in Islamic banks group which is around 63%, while in Sample1 this ratio is around

54%. These ratios indicate that non-Islamic and Islamic banks in the Sample2 are also more comparable in term of their assets size.

The capital-to-assets ratio, *CAR*, of non-Islamic banks is statistically lower than non-Islamic banks at 10% level of significance in Sample1. This implies that Islamic banks, in general, have higher capital cushions than their conventional counterparts, reflecting lower risks, and in relation to its profitability, may indicate support for the conventional risk-return hypothesis. For ratio of loan-loss provisions to total loans, *LLP*, Islamic banks have a statistically significant lower average value to those of non-Islamic banks in both Sample1 and Sample2, suggesting lower credit risk. On the other hand, the average loan-to-asset ratio, *LAR*, of Islamic banks reaches more than 80%, much higher than the average non-Islamic bank in both samples. The high value of *LAR* in Islamic banks could presumably be one of the consequences of complying with the Islamic finance principles. In particular, the prohibition on interest, the real asset-linked or 'materiality' principles and the prohibition on speculative transactions are, in turn, restraining the choice of sharia-compliant products, limiting product diversification on Islamic bank operations, so that Islamic banks may not have as many choices as non-Islamic banks for their assets portfolio and mainly concentrate on loans. In addition, there are very limited sharia-compliant securities available in the Indonesian market due to sharia-compliant issues.[22] This distinct background of the loan-to-asset ratio across the two banking groups makes it a good candidate for an explanatory variable in explaining any differences between variability in profitability of Islamic and non-Islamic banks, rather than merely functioning as a control variable.

[22] This shallow market-for-liquidity problem is not solely endured by Indonesian Islamic banking sector but also in other jurisdictions, as stated in the Islamic Financial Service Board, Guiding Principles of Liquidity Risks (IFSB, 2012).

1.4 Empirical Results

1.4.1 Dynamic Estimations

This part of empirical work aims at investigating the dynamics of individual bank profitability and exploring any difference in the dynamic response of the two banking groups across business cycles. In order to check for the dynamic specification, OLS and Within Group estimations are applied to provide the credible range for the lag dependent variable.[23] Estimations of the baseline model use the growth of industrial production index, *IPI*, and of domestic cement consumption, *CMT*, as business cycle variables. Since results are fairly similar, only estimations with *IPI* are shown in the estimations with control variables.

Overall, the system GMM estimator works well with estimated coefficient of the lagged dependant variable fall within the credible range as in Bond (2002) for all the estimation with a relatively stable value. The Wald-test indicates reasonably well goodness-of-fit and the Hansen-test for over-identifying restriction shows appropriately chosen instruments with no sign of too-many instruments and weak instruments problems encountered. However, while the significance of AR(1) tests is expected, the rejection of the null for AR(2) indicates that the idiosyncratic error follows first-order serial correlation in level although we have included the necessary lags based on unit-root test results. This significant serial-correlation would render the second lag invalid as instrument and would result in inconsistency (Arellano and Bond, 1991). Nevertheless, using deeper lags as instruments would keep the estimator consistent, since the assumption of instruments-error exogeneity is still valid and the errors are uncorrelated across banks. For this reason, the lags used as instruments are third lag and deeper. Another overall performance observed is that almost none of the implied long-run effect is significant, partly because the long-run effect is very sensitive to the rate of convergence. According to Bond *et al.* (2001), there is "a great deal of uncertainty in measuring convergences rates" (p.22). In addition, the long-run effects are more prone to possible reverse causation.

[23] Although the dynamic specification checks are undertaken for all estimations, to save space we only provide the results for the baseline estimation on Sample1.

Table 1.4.1(a) shows the baseline estimations with growth of *IPI* and *CMT* using two-step GMM and provides the dynamic specification check using OLS and Within Group on Sample1.[24] The estimated coefficients of the lagged dependent variable for *IPI* and *CMT* are the same. It is highly significant with a value of 0.917 (row (1), columns (3) and (6)) and fall within the credible range of 0.870-0.925 (row (1), columns (1)-(2) and (4)-(5)) with much smaller standard errors. This estimated value is associated with a speed of adjustment of around 0.083 periods, which implies that, after a shock, bank profitability will return to its long-run equilibrium in around 12 months. These results may indicate that annual persistency in Indonesian bank profitability is quite limited.

Table 1.4.1(a) Results of dynamic baseline estimation using growth of: Industrial Production Index (IPI) and real domestic cement consumption (CMT) in Sample1

		Z: ΔIPI			Z: ΔCMT		
		(1)	(2)	(3)	(4)	(5)	(6)
		OLS	OLS-FE	BB	OLS	OLS-FE	BB
(1)	π_{it-1}	0.925***	0.870***	0.917***	0.925***	0.870***	0.917***
		(0.0298)	(0.0481)	(0.0160)	(0.0298)	(0.0481)	(0.0159)
(2)	$(Z \times NI)_t$	0.0154	0.0149**	0.0152**	0.00469	0.00413	0.00467*
		(0.00941)	(0.00670)	(0.00655)	(0.00348)	(0.00253)	(0.00259)
	$(Z \times NI)_{t-1}$	0.00107	0.00141	0.000630	-0.00219	-0.00228	-0.00199
		(0.00777)	(0.00613)	(0.00577)	(0.00342)	(0.00264)	(0.00241)
(3)	Z_t	-0.00213	-0.00167	-0.00223	-0.00260	-0.00210	-0.00261
		(0.00799)	(0.00581)	(0.00568)	(0.00327)	(0.00231)	(0.00245)
	Z_{t-1}	-0.00370	-0.00354	-0.00380	0.00153	0.00175	0.00149
		(0.00607)	(0.00511)	(0.00507)	(0.00321)	(0.00242)	(0.00220)
Observations		8,542	8,542	8,542	8,542	8,542	8,542
R-squared		0.860	0.759	-	0.860	0.759	-
Number of ID		-	132	132	-	132	132
ABAR(1) p-value				0.001			0.001
ABAR(2) p-value				0.054			0.055
Hansen test p-value				0.806			0.81

Note: For OLS and OLS-FE: clustered standard error in parentheses, for BB: robust two-step standard error with small-sample correction in parentheses. Coefficient that are significantly different from zero at the 1%, 5% and 10% level are marked with ***, **, and * respectively. All estimations include NI dummy and a constant. The Blundel-Bond (BB) system-GMM is two-step estimates with forward orthogonal deviation. All BB estimations use lags 3 and 4 as instrument (9 total number of instruments). The Hansen test is the test for overidentifying restrictions. ABAR(1) and ABAR(2) refer to Arellano-Bond test for autocorrelation of order 1 and 2 respectively, with null of no autocorrelation.

[24] Windmeijer (2005) finds a small-sample correction method that makes two-step GMM estimator modestly superior to robust one-step. Previously before the correction, the standard errors are downward biased when the number of instrument is large (Arellano and Bond, 1991).

Table 1.4.1(b) provides the baseline GMM estimations and the implied responses of *ROA* to *IPI* and *CMT* on Sample1 and Sample2. The coefficients of interest, the interaction terms of business cycle variables with dummy NI in current period (row (2), columns (1)-(4)) are significant in both sample sets at 5% and 10% level of significance for *IPI* and *CMT*, respectively. Thus, there is evidence that Islamic and non-Islamic banks have different short-run responses to shocks on both *IPI* and *CMT*. These results confirm that non-Islamic banks' profitability is less stable than Islamic banks in the short-run. For 10% monthly growth of *IPI*, there is an additional increase of 15 bps and 20 bps on non-Islamic banks' *ROA* in Sample1 (column (1)) and Sample2 (column (2)), respectively. For *CMT* the differences are even smaller, only up to a 5 bps increase on non-Islamic banks' *ROA* in both sample sets (columns (3) and (4)). Nevertheless, the implied differences in long-run effects (row (6)) are generally not statistically significant for both business cycle variables, except for *IPI* in Sample2 (column (2)). These insignificant results may well be related to the sensitivity of the rate of convergence discussed above.

The implied responses of non-Islamic banks to the business cycle in the short-run are significant at 1% level of significance for *IPI* in both sample sets (row 4, columns (1) and (2)) and for *CMT* in Sample2 (row 4, column (4)), and at 5% level of significance for *CMT* in Sample1 (row (4), column (3)). These short-run responses are procyclical, as expected, albeit fairly small for at most 17 bps increases in *ROA* for every 10% monthly growth of *IPI* (row (4), column (2)). As for the implied long-run effects, the responses of non-Islamic banks are also statistically significant at 10% and 5% level of significance in Sample1 and Sample2, respectively (row (7), columns (1) and (2)). While for Islamic banks neither the short-run nor the long-run response is significantly different from zero (rows (5) and (8)). Yet this does not necessarily imply that Islamic banks' revenues are unaffected by business cycles, as we shall see in the results which consider control variables in the model.

These baseline results for the dynamic estimation are supported by the same regressions on annualized profits as the numerator of *ROA*. The results in Table A1.4 of the Appendix 1 show that non-Islamic banks' profits have larger response to *IPI* in the short-run

in comparison to Islamic banks in both sample sets, but the implied differences are not significant in the long-run.

Overall, the baseline estimations show stronger results on Sample2, especially in the case with *IPI* as the business cycle variable. Not only that the estimated short-run difference is larger in Sample2 than in Sample1, the test on implied effects shows that these differences are also statistically significant in the long-run at 10% level of significance (row (9), column (2)). These results indicate that the choice of banks in the sample set is important. By choosing more comparable banks across the two groups the potential difference could be better revealed.

Table 1.4.1(b) Results of dynamic baseline estimation in Sample1 and Sample2

		Z: ΔIPI		Z: ΔCMT	
		(1)	(2)	(3)	(4)
		Sample1	Sample2	Sample1	Sample2
(1)	π_{it-1}	0.917***	0.912***	0.917***	0.910***
		(0.016)	(0.019)	(0.0159)	(0.020)
(2)	$(Z \times NI)_t$	0.015**	0.020***	0.005*	0.005*
		(0.007)	(0.007)	(0.003)	(0.003)
	$(Z \times NI)_{t-1}$	0.001	0.003	-0.002	0.002
		(0.006)	(0.006)	(0.002)	(0.002)
(3)	Z_t	-0.002	-0.002	-0.003	-0.002
		(0.006)	(0.006)	(0.002)	(0.003)
	Z_{t-1}	-0.004	-0.004	0.001	-0.002
		(0.005)	(0.005)	(0.002)	(0.002)
Observations		8,542	6,372	8,542	6,372
Number of ID		132	100	132	100
Implied short-run effects					
(4)	NI	0.013***	0.017***	0.002**	0.003***
		(0.003)	(0.004)	(0.001)	(0.001)
(5)	I	-0.002	-0.002	-0.002	-0.002
		(0.006)	(0.006)	(0.002)	(0.003)
Implied long-run effects					
(6)	Z x NI	0.191	0.254*	0.033	0.088
		(0.117)	(0.130)	(0.032)	(0.062)
(7)	NI	0.118*	0.185**	0.019	0.037
		(0.065)	(0.087)	(0.014)	(0.023)
(8)	I	-0.073	-0.069	-0.014	-0.051
		(0.089)	(0.084)	(0.027)	(0.049)
Test that long-run effects equal to short-run effects: Chi2(1) (p-value)					
(9)	Z x NI	2.47	3.51*	0.8	1.98
		(0.116)	(0.061)	(0.371)	(0.160)
(10)	NI	2.78	4.00**	1.48	2.26
		(0.096)	(0.045)	(0.224)	(0.133)
(11)	I	0.69	0.69	0.18	1.09
		(0.406)	(0.407)	(0.670)	(0.296)
ABAR(1) p-value		0.001	0.003	0.001	0.002
ABAR(2) p-value		0.054	0.064	0.055	0.064
Hansen test p-value		0.806	0.819	0.81	0.827

Note: Blundel-Bond (BB) two-steps system GMM with forward orthogonal deviation. Robust two-step standard error with small-sample correction in parentheses. Coefficient that are significantly different from zero at the 1%, 5% and 10% level are marked with ***, **, and * respectively. All estimations include NI dummy and a constant; use lags 3 and 4 as instruments. The Hansen test is the test for overidentifying restrictions. ABAR(1) and ABAR(2) refer to Arellano-Bond test for autocorrelation of order 1 and 2 respectively, with null of no autocorrelation. The standard errors for the implied effects were calculated using the Delta method. Sample1 consists of all banks; Sample2 consists of private banks. The values in rows (9)-(11) are Chi2 statistics with 1 degree of freedom and the associating p-values are in parentheses.

Table 1.4.2 shows the estimation results of model (1.3) using growth of *IPI* as a business cycle variable with inclusions of control variables one at a time which are shown in separate columns. This strategy is undertaken to limit the number of instruments in order to avoid the too-many instruments problem explained in the previous section, and to have a better knowledge of which control variable of bank characteristics could actually serve as an explanatory variable in explaining any differences in profitability variation between Islamic and non-Islamic banks. The intuition is that any bank characteristics in which inclusion renders the observed difference could be a good candidate for an explanatory variable.

Overall, the estimated coefficients of interest, the interaction term of *IPI* and dummy NI (row (2), columns (1) - (6)), are significant in the short run at a minimum of 5% level of significance, with relatively stable values around 14.9-15.5 bps and 17.6-20 bps differences in *ROA* for each 10% monthly growth of *IPI* in Sample1 and Sample2, respectively. Exceptionally for *LAR* (columns (7) – (8)), the inclusions of control variables do not change the short-run significant results. However, similar with the results of baseline estimations, the implied long-run differences are generally not significant (row (8)), except for *SIZE* in Sample2 (row (8), column (6)). For the full-exogeneity assumption of each control variable, the Hausman tests support the model with full-exogeneity assumption.[25]

The estimations with capital-to-assets ratio, *CAR*, as control variable are shown in column (1) and column (2) for Sample1 and Sample2, respectively. The regression results show that the inclusion of *CAR* does not alter the significance of the estimated coefficients of the interaction between *IPI* and NI dummy in row (2). While *CAR* seems insignificantly affect bank profitability, it does deliver higher volatility to bank profitability alongside the movement of *IPI*. However, the estimated parameters are fairly negligible, where a 10% increase in *CAR* only delivers around 0.5 bps additional *ROA*, and relatively weak at 10% level of significance (row (3)) in both sample sets. This indicates that banks with higher *CAR* achieve slightly higher profits in good times. Table 1.3.1 of summary statistics shows

[25]The Hausman test p-values for null of no systematic difference between modelling CAR, LLP and LAR as predetermined or exogenous are 0.999, 0.3327 and 0.983, respectively for Sample1; and are 1.000, 0.1326 and 1.000, respectively for Sample2.

that Islamic banks on average have marginally higher *CAR* than non-Islamic banks, yet this does not erode the significant short-run difference on the effect of business cycle to bank profitability.

Similar results are found from the inclusion of credit risks, *LLP*, in column (3) and (4) for Sample1 and Sample2, respectively. The estimated coefficients on the interacted parameter of interest in row (2) are still significant, with reasonably unaffected magnitudes in comparison to the baseline case. In addition, as the theory expects, *LLP* decreases bank profitability. A 10% increase in *LLP* is associated with 173 bps subtraction off a bank's *ROA* at 1% level of significance in the short-run for Sample1 (row (5), column (3)). The result for Sample2 is fairly similar with slightly smaller effect of *LLP* to *ROA* and at a lower level of significance (row (5), column (4)).

Inclusion of control variable that represents assets size, shown in column (5) and (6), also could not explain the significant short-run differences. On the other hand, the results show that profitability of larger banks is significantly less sensitive to business cycle fluctuation. In particular, a bank which is 10 times larger than the average size of banks in the industry show 2 bps less short-run responses on their *ROA* to 10% growth of IPI for Sample1 at 1% level of significance, while the number is 3 bps for Sample2 at 5% level of significance (row (3), column (5) and (6), respectively). Apparently, economies of scale that work through higher loans diversification may provide stability for larger banks. However, unlike the previous results on other control variables, the implied long-run difference in Sample2 is statistically significant at 10% level (row (8), column (6)). In addition, similar with the baseline estimation, the test on the implied effects shows that the estimated interaction terms of *IPI* and dummy NI in the short-run and in the long-run are statistically different at 10% level of significance (row (8), column (6)).

The estimations with loan-to-asset ratio, *LAR*, for Sample1 and Sample2 are shown in column (7) and (8), respectively. Contrary to previous results, the inclusion of *LAR* eliminates the significance of any difference in short-run business cycle effects across the two types of banks (row (2)). In addition, the estimated coefficient on the interaction-term

of *IPI* and *LAR* in row (3) shows that 10% higher *LAR* slightly reduces business cycle sensitivity of bank profitability around 0.5 bps and 0.6 bps at 1% level of significance in Sample1 and Sample2, respectively. This statistically significant finding supports the view of previous studies by DeYoung and Roland (2001), and Stiroh (2004), which conclude that banks with lower products mix actually have lower revenue volatility. The reason behind these findings is that revenues from traditional lending businesses are relatively more stable over time due to a more stable bank-costumer relationship. On the other hand, this result stands in opposition to Cihak and Hesse (2008), who assert that banks with higher *LAR* tend to have a higher risk of insolvency. Moreover, higher *LAR* is also associated with a higher liquidity risk. The empirical evidence from this study may indicate that in the short-run the adverse effect of liquidity risk is falling behind the benefits of traditional lending activities, though in a fairly limited magnitude. Table 1.3.1 shows that Islamic banks on average have a notably higher *LAR*, around 24-25% higher, than average non-Islamic banks in both sample sets. As explained previously, this observed difference originated from Islamic banks adhering to Islamic finance principles which, in turn, constrain their assets-portfolio. Based on this inherent difference and the regression result, which shows that banks with higher *LAR* have more stable profitability amid the business cycle, the inclusion of *LAR* actually explains the different responses of Islamic banks and non-Islamic banks to business cycle fluctuations in the short-run. Hence, *LAR* could serve as a good candidate of an explanatory variable, in which according to estimated coefficient in row (3) this higher *LAR* explains up to 1.28 bps and 1.46 bps lower response of Islamic banks' *ROA* in comparison to the average of non-Islamic banks in Sample1 and Sample2, respectively. Also different from previous results, the inclusion of *LAR* entails significant, procyclical effects of bank profitability to business cycle on both types of banks in which 10% monthly growth of *IPI* is associated by around 4 - 5 bps increase in banks' *ROA* (rows (6) and (7), non-Islamic and Islamic banks, respectively) .

Table 1.4.2 Results of dynamic estimation using growth of Industrial Production Index in Sample1 and Sample2

		X: CAR		X: LLP		X: SIZE		X: LAR	
		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
		Sample1	Sample2	Sample1	Sample2	Sample1	Sample2	Sample1	Sample2
(1)	π_{it-1}	0.918***	0.913***	0.900***	0.888***	0.906***	0.899***	0.911***	0.906***
		(0.0401)	(0.0435)	(0.0516)	(0.0630)	(0.0261)	(0.0278)	(0.0451)	(0.0479)
(2)	$(\Delta IPI \times NI)_t$	0.0149**	0.0176**	0.0155**	0.020***	0.0151**	0.020***	0.0006	0.0017
		(0.007)	(0.007)	(0.006)	(0.007)	(0.006)	(0.007)	(0.007)	(0.008)
	$(\Delta IPI \times NI)_{t-1}$	-0.0005	0.0024	0.0014	0.0038	0.0005	0.0031	0.0020	0.0055
		(0.007)	(0.007)	(0.006)	(0.007)	(0.006)	(0.007)	(0.007)	(0.008)
(3)	$(\Delta IPI \times X_i)_t$	0.0005*	0.0005*	0.0001	0.0003	-0.002***	-0.003**	-0.0005***	-0.0006***
		(0.000)	(0.000)	(0.002)	(0.002)	(0.001)	(0.001)	(0.000)	(0.000)
	$(\Delta IPI \times X_i)_{t-1}$	-0.0003	-0.0003	-0.0011	-0.0009	0.0002	-0.0008	0.0001	0.0001
		(0.000)	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)	(0.000)	(0.000)
(4)	ΔIPI_t	-0.0119	-0.0116	-0.0038	-0.0040	-0.0014	-0.0001	0.0397**	0.052***
		(0.008)	(0.009)	(0.007)	(0.007)	(0.006)	(0.006)	(0.016)	(0.019)
	ΔIPI_{t-1}	0.0019	0.0021	-0.0014	-0.0018	-0.0038	-0.0032	-0.0097	-0.0152
		(0.008)	(0.008)	(0.006)	(0.006)	(0.005)	(0.005)	(0.017)	(0.022)
(5)	X_{it}	0.0017	0.0021	-0.173***	-0.163**	-0.0091	0.0788	-0.0008	-0.0009
		(0.002)	(0.002)	(0.062)	(0.069)	(0.099)	(0.151)	(0.006)	(0.006)
	X_{it-1}	-0.0017	-0.0014	0.173***	0.162**	0.0174	-0.0549	0.0015	0.0015
		(0.002)	(0.001)	(0.065)	(0.075)	(0.099)	(0.147)	(0.006)	(0.006)
Observations		8,502	6,332	8,487	6,317	8,542	6,372	8,523	6,353
Number of ID		132	100	132	100	132	100	132	100

Notes: Blundel-Bond (BB) system GMM with forward orthogonal deviation; robust two-step standard error for small-sample correction in parentheses. Coefficient that are significantly different from zero at the 1%, 5% and 10% level are marked with ***, **, and * respectively. All estimations include NI dummy and a constant; use lags 3 to 5 as instruments for π_{it-1}, and assume that other regressors as exogenous. Sample1 consists of all banks; Sample2 consists of private banks.

Table 1.4.2 Continued

		X: CAR		X: LLP		X: SIZE		X: LAR	
		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
		Sample1	Sample2	Sample1	Sample2	Sample1	Sample2	Sample1	Sample2
Implied short-run effects									
(6)	NI	0.0036	0.0065	0.012***	0.016***	0.012***	0.016***	0.040***	0.053***
		(0.005)	(0.006)	(0.004)	(0.004)	(0.003)	(0.004)	(0.011)	(0.014)
(7)	I	-0.0113	-0.011	-0.004	-0.004	-0.003	-0.003	0.039**	0.051***
		(0.008)	(0.008)	(0.006)	(0.006)	(0.006)	(0.006)	(0.016)	(0.019)
Implied long-run effects									
(8)	ΔIPI x NI	0.176	0.228	0.170	0.208	0.167	0.223*	0.0300	0.0765
		(0.142)	(0.162)	(0.120)	(0.139)	(0.108)	(0.119)	(0.109)	(0.117)
(9)	NI	0.0573	0.121	0.107*	0.150*	0.096*	0.152**	0.363	0.464
		(0.085)	(0.127)	(0.064)	(0.088)	(0.058)	(0.075)	(0.271)	(0.339)
(10)	I	-0.119	-0.107	-0.062	-0.058	-0.071	-0.072	0.333	0.387
		(0.142)	(0.132)	(0.101)	(0.089)	(0.079)	(0.073)	(0.315)	(0.365)
Test that long-run effects equal to short-run effects: Chi2(1) (p-value)									
(11)	ΔIPI x NI	1.37	1.76	1.75	1.95	2.15	3.20*	0.08	0.45
		(0.242)	(0.185)	(0.186)	(0.162)	(0.143)	(0.074)	(0.778)	(0.503)
(12)	NI	0.44	0.88	2.37	2.41	2.23	3.44*	1.49	1.53
		(0.507)	(0.347)	(0.124)	(0.121)	(0.135)	(0.064)	(0.222)	(0.215)
(13)	I	0.62	0.57	0.37	0.41	0.8	0.98	0.92	0.9
		(0.433)	(0.452)	(0.543)	(0.520)	(0.371)	(0.322)	(0.337)	(0.343)
ABAR(1) p-value		0.001	0.004	0.001	0.004	0.001	0.003	0.001	0.003
ABAR(2) p-value		0.048	0.057	0.140	0.155	0.054	0.064	0.067	0.079
Hansen test p-value		0.690	0.716	0.574	0.410	0.719	0.745	0.643	0.670

Notes: Coefficient that are significantly different from zero at the 1%, 5% and 10% level are marked with ***, **, and * respectively. The Hansen test is the test for overidentifying restrictions. ABAR(1) and ABAR(2) refer to Arellano-Bond test for autocorrelation of order 1 and 2 respectively, with null of no autocorrelation. The standard errors for the implied effects were calculated using the Delta method.

The results of dynamic estimations in this first part of analysis show that, while the differences in the responses of Islamic and non-Islamic banks to business cycle fluctuations are observed in the short-run (row (2) in Table 1.4.1 (a)-(b) and Table 1.4.2), overall there are little evidences of significant long-run differences (row (6) in Table 1.4.1 (b) and row (8) in Table 1.4.2), except for Sample2 in the baseline case and in the model that control for *SIZE*. Nonetheless, the significant short-run differences and the overall responses of bank's *ROA* to evolution of *IPI* are fairly small. These dynamic results are somewhat reflected by the general results from static estimations in the robustness check from the second part of analysis.

1.4.2 Static Estimations

The static estimations use average profitability of the whole banking industry as the Z_t variable. This part of analysis is undertaken to generally explore and compare fluctuations of profitability across Islamic and non-Islamic banks. Table 1.4.3 shows the estimation results of model (1.1), with the inclusion of one bank characteristic at a time.

Overall, although simple regression on volatility of *ROA* in Table A1.2 shows that non-Islamic banks tend to have higher profits volatility than Islamic banks, especially in Sample2, the static results show that there are no evidences of different fluctuations across the two groups. The estimated coefficients on the interaction terms of Z_t with dummy NI are not different from zero (row (1), columns (1)-(10)). The baseline model, that excludes any control variable, shows that profitability of Islamic and non-Islamic banks generally fluctuate alongside each other as in the implied responses which are 0.999 and 1.056 in Sample1 (column (1)), and 1.085 and 0.873 in Sample2 (column (2)) for non-Islamic (row (5)) and Islamic (row (6)) banks, respectively. None of the inclusion of control variables affects the no-difference results. However, these weak results may be affected by the small number of Islamic banks (11 banks) in comparison to non-Islamic banks (128 banks in Sample1 and 96 banks in Sample2) which could trivialize their presence in the Z_t variable in these estimations.

Table 1.4.3 Results of static estimation using average profitability of banking industry

	Baseline		X: CAR		X: LLP		X: SIZE		X: LAR	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Sample1	Sample2	Sample1	Sample2	Sample1	Sample2	Sample1	Sample2	Sample1	Sample2
(1) $(Z \times NI)_t$	-0.057	0.212	0.207	0.255	-0.739	-0.308	0.045	0.328	-0.980	-0.525
	(0.828)	(0.808)	(1.147)	(0.883)	(0.649)	(0.576)	(0.863)	(0.879)	(0.987)	(0.777)
(2) $(Z \times X_i)_t$	-	-	0.075	0.057	0.230	0.125	-0.140	-0.238	(0.066)	-0.045
			(0.128)	(0.0864)	(0.161)	(0.111)	(0.088)	(0.202)	-0.041	(0.033)
(3) Z_t	1.056*	0.873*	-0.592	-0.399	0.473	0.563	1.101*	1.008**	5.722*	4.073*
	(0.617)	(0.465)	(2.903)	(2.008)	(0.716)	(0.529)	(0.614)	(0.466)	(3.008)	(2.445)
(4) X_{it}	-	-	-0.184	-0.109	-0.577	-0.252	0.258	0.578*	0.181	0.105
			(0.319)	(0.171)	(0.380)	(0.191)	(0.250)	(0.355)	(0.117)	(0.087)
Observations	8,674	6,472	8,646	6,444	8,622	6,420	8,674	6,472	8,656	6,454
R-squared	0.005	0.014	0.013	0.024	0.078	0.075	0.006	0.016	0.030	0.036
Number of ID	132	100	132	100	132	100	132	100	132	100
Implied response:										
(5) NI (1)+(2)+(3)	0.999*	1.085*	-0.310	-0.087	-0.036	0.380	1.006*	1.098*	4.676*	3.503
	(0.557)	(0.652)	(1.867)	(1.246)	(0.364)	(0.329)	(0.560)	(0.661)	(2.694)	(2.354)
(6) I (2)+(3)	1.056*	0.873*	-0.517	-0.342	0.704	0.687	0.961	0.770*	5.656*	4.029*
	(0.617)	(0.465)	(2.777)	(1.925)	(0.644)	(0.487)	(0.614)	(0.460)	(2.969)	(2.413)

Note: Z_t is the average profitability of banks in the sample class. Clustered standard errors in parentheses. All estimations include a constant and NI dummy. All standard errors of the implied response are calculated using Delta method. Coefficients that are significantly different from zero at the 1%, 5% and 10% level are marked with ***, **, and * respectively. Sample1 consists of all banks; Sample2 consists of private banks.

1.4.3 Discussion

The former dynamic estimations in the first part which show that there exist small, but statistically significant, differences in profit stability across non-Islamic and Islamic bank in the short-run, and the no-difference results of the static estimations in the second part of empirical works show that in general there are hardly any difference in profit variability of the two types of banks.[26] These results indicate that the differences in the dynamic responses are not large enough to derive a significant difference in the overall profits variability. Nevertheless, estimations that only consider privately-owned non-Islamic banks in Sample2 show larger and more consistent differences which are even transmitted to the long-run in the baseline case, and if we control for bank's assets size. These results, as also supported by the results of simple regression in Table A1.2, imply that the potential difference could be better revealed by choosing more comparable banks across the two groups.

There are several factors behind these empirical results. From the econometrics methodology point of view, the convergence-sensitivity of dynamic panel setting explained previously may play some role in delivering these results. It could also be derived by the sample's composition in which the total numbers of Islamic banks are relatively too few in comparison to non-Islamic banks, so that Islamic banks may not be well represented by the data sets which further weaken the statistical power. The other possible explanation is that there might be not enough fluctuations in the business cycle to expose the potential differences during the period of observation.

From a banking practice point of view, these results may initiate from the possibility that some Islamic banks in Indonesia may try to smooth out the payment to depositors in order to sustain their competitiveness and prevent the withdrawal of funds. Thus, changes in the assets side may not fully absorbed by the liability side, which is contrary to the original concept of an Islamic bank's inherent stability propounded by Khan and Mirakhor (1987) and Askari *et al.* (2010). The practice of income smoothing is widely known in Islamic

[26] For another robustness check, z-score values are calculated using 12-months moving windows of standard deviation of profitability. The OLS estimation result on z-score is presented in Table A1.3 in the appendix shows no significant difference.

banking business (see, among others, Sundararajan (2005) and Farook *et al.* (2012)). Formally, an international standard-setting organisation for Islamic financial service providers issues a guidance note for the application of profit equalisation reserve, i.e. a reserve created for appropriating a specific amount out of total income before allocating the share of income that belongs to the particular Islamic bank (IFSB, 2010). This reserve is then used for smoothing the payment to depositors. However, Islamic banks in Indonesia do not yet acknowledge this particular reserve. One of the possible ways of smoothing other than using a dedicated reserve is by giving banks a share of profits as a bonus to their depositors, voluntarily and not included in the deposit contract. The fact that the Islamic banking industry in Indonesia is still around 5% of the total market in the dual banking system may possibly cause some Islamic banks to retain their payment to depositor as close as possible to their non-Islamic counterparts.[27] While religious reasons may work as a strong factor in keeping individual depositors loyal to their Islamic banks, presumably this may not be the case for profit-oriented corporate customers. In short, there is possibility that some Islamic banks in Indonesia may not purely apply a profit sharing mechanism in paying their depositors, which is otherwise necessary for profit stability. Nevertheless, future research is needed to further investigate this income smoothing possibilities.

1.5 Conclusion

This study empirically tests the theoretical inherent stability of Indonesian Islamic banks in comparison to non-Islamic banks in term of banks' profitability. The profit evolution of Islamic and non-Islamic banks in general shows a small but statistically significant sensitivity to the evolution of business cycle variable, which is represented by the Industrial Production Index in this study. However, we find that Islamic banks' profitability is less sensitive to business cycle fluctuations in the short-run in comparison to non-Islamic banks, though also with a fairly limited magnitude. This short-run difference is partly

[27] Reports on Islamic banking development in Indonesia show that the share of individual customers deposits value to total deposits is decreasing from around 75% in 2008 to around 50% in 2011 onwards (Bank Indonesia, 2012), though the number of individual customers account is not decreasing.

explained by the higher loan-to-asset ratio of Islamic banks in which there is evidence that profitability of banks that hold higher loans in their assets portfolio is less sensitive to the business cycle. These results are even robust when we construct a sample with more comparable banks across types. Nonetheless, overall we could not observe significant differences in fluctuations of Islamic and non-Islamic banks profitability.

One of the implications of this is that, in applying macro-prudential policy, a regulator should observe Islamic banks as cautiously as their conventional counterparts. In particular, capital to asset ratio as the buffer component in the z-score as the measurement of probability of default should be regulates equivalently for both types of banks.

Appendix 1

Table A1.1 Serial test

Variables	Statistics	p-value	Average lags
ROA	-11.812	0.000	0.58
CAR	-26.309	0.000	0.36
LAR	-7.379	0.000	0.33
LLP	-1.923	0.027	0.39
SIZE	-1.319	0.093	0.25
Profits	-1.594	0.055	0.61

Notes: Im, Pesaran and Shin unit-root test where the AR parameters are panel specific, panel means are included, and time trend is not included. The null is all panels contain unit-roots. The average lags are chosen by Bayesian Information Criteria.

Table A1.2 Estimation on Standard deviation of ROA

	Sample1	Sample2
NI	0.168	0.230*
	(0.119)	(0.138)
Constant	0.500***	0.500***
	(0.092)	(0.092)
Observations	746	557
R-squared	0.001	0.002

Notes: OLS estimations on 12-months standard deviation of ROA. Clustered standard error in parentheses. Coefficients that are significantly different from zero at the 1%, 5% and 10% level are marked with ***, **, and * respectively.

Table A1.3 Estimation on Z-score

	Sample1	Sample2
NI	-1.853	7.897
	(20.439)	(21.250)
CAR	0.936***	0.746***
	(0.284)	(0.257)
LAR	0.281	0.252
	(0.287)	(0.348)
LLP	-0.589**	-0.671***
	(0.251)	(0.245)
SIZE	1.538	-2.914
	(1.456)	(2.113)
Observations	7,087	5,237
R-squared	0.063	0.058

Notes: OLS estimations on Z-score based on 12-months rolling windows standard deviation of ROA. Clustered standard error in parentheses. Coefficients that are significantly different from zero at the 1%, 5% and 10% level are marked with ***, **, and * respectively. All estimations include a constant term and time dummies.

Table A1.4 Dynamic baseline estimation on the numerator (Profits) and the denominator (Assets) of ROA

	Y: Annualized Profits			Y: Annualized Profits	
	(1)	(2)		(1)	(2)
	Sample 1	Sample 2		Sample 1	Sample 2
Y_{it-1}	1.007***	0.929***	**Implied short-run effects**		
	(0.0192)	(0.034)	NI	0.793	0.562**
$(\Delta IPI \times NI)_t$	1.047*	0.719*		(0.548)	(0.223)
	(0.632)	(0.425)	I	-0.254	-0.157
$(\Delta IPI \times NI)_{t-1}$	-0.435	-0.094		(0.306)	(0.368)
	(0.431)	(0.261)	**Implied long-run effects**		
ΔIPI_t	-0.254	-0.157	Z x NI	-78.909	8.797
	(0.306)	(0.368)		(109.405)	(7.818)
ΔIPI_{t-1}	-0.097	-0.179	NI	-33.610	4.076
	(0.182)	(0.210)		(99.655)	(4.204)
Observations	8,542	6,356	I	2.338	-4.722
Number of ID	132	100		(27.65)	(6.255)
ABAR(1) p-value	0.036	0.019			
ABAR(2) p-value	0.036	0.133			
Hansen test p-value	0.222	0.127			

Notes: The values of the annualized profits is in trillions IDR. Clustered one-step and robust two-step standard error with small-sample correction in parentheses for Profits and Assets respectively. Coefficient that are significantly different from zero at the 1%, 5% and 10% level are marked with ***, **, and * respectively. All estimations include NI dummy and a constant. Estimation (1) and (2) use lag 3-7 and lag 2-25 as instruments respectively. The Hansen test is the test for overidentifying restrictions. ABAR(1) and ABAR(2) refer to Arellano-Bond test for autocorrelation of order 1 and 2 respectively, with null of no autocorrelation. The standard errors for the implied effects were calculated using the Delta method.

Chapter 2 How Do Islamic Banks Affect the Transmission of Monetary Policy? The Case of Indonesia

2.1 Introduction

Over the last decade, the Islamic banking industry has shown a remarkable growth path. Annual assets growth reached 10-15%, a trajectory that is expected to continue in the future. The size of the global Islamic financial industry reached USD1.357 trillion in 2012. This rapid growth not only exists in countries with a Muslim majority, like Malaysia, Indonesia and Middle Eastern countries, but also in countries such as the United Kingdom and Japan, where Muslims are in a minority. This growth trend shows the increasing presence of Islamic banks in the conventional financial systems, which, with their unique characteristics, may well force policy makers at the monetary authority to become acquainted with its processes, and, in particular, its implications for the transmission mechanism of monetary policy.

The general principles of Islamic finance could be summarized, but not limited, to the following: prohibition of interest, thus encouraging profit and loss sharing; prohibition of contractual uncertainty; and prohibition of gambling, speculation or excessive risk-taking in undertaking transactions (Askari *et al.*, 2010). Islamic principles also promote a

"materiality" aspect, requiring the linking of financing directly with the underlying asset so that any "financing activity is clearly and closely identified with the real economy" (Iqbal and Mirakhor, 2007), and the real and financial sectors are integrated. Consequently, in complying with these principles, some of the readily available financial products may not be suitable for the Islamic system. But, on the other hand, due to prohibition on speculative transactions, the Islamic system is thought to be more predictable and have closer links to the policy objectives, presumably enabling more effective monetary policy by the authority. Moreover, the religious motives behind depositors and borrowers of Islamic banks (Khan and Khanna, 2012) may curtail any influence of the interest rate shock. All of these implications necessitate the need for theoretical and empirical studies around the issue of the monetary policy transmission mechanism that works through Islamic banks.

The traditional channel of monetary policy in the light of the money view emphasises the role of changes in interest rates in affecting aggregate demand through consumption, saving and investment. For the latter, the direct interest rate channel operates through the user cost of capital, widely known as the cost channel (Mishkin, 1995). In a bank-based economy, where banks play a main role in the financial industry, this may imply a direct effect of lending rates on firms' marginal production costs.[28] Thus, in this set-up, how retail rates of the banking industry respond to monetary policy – nowadays, commonly through monetary authority setting of a policy rate with money market rates as its intermediate target – largely determines the policy effectiveness. There are a number of empirical studies that focus on the pass-through of the policy rate or market rates to lending rates, such as Cottarelli and Kourelis (1994), Borio and Fritz (1995) and, more recently, Gigineishvili (2011) and Illes and Lombardi (2013), on cross-country experiences, and Hofmann and Mizen (2001), Weth (2002) and Gambacorta (2008) for individual countries using individual bank-level data. On the other hand, financial structures and the development of financial markets influence the effectiveness of the particular transmission channel. Moreno (2008)

[28] In addition, there is also the credit channel in which the transmission mechanism works by affecting banks' supply of loans rather than the lending rate. Nevertheless, rather than a completely independent channel, Bernanke and Gertler (1995) suggests that this channel is an enhancement of the interest rate channel.

suggests that in the undeveloped and shallow bond market, the longer-term rate tends to be insensitive to the policy rate. In such a market, volatility is considerably high and therefore fails to produce reliable signals which would otherwise be necessary in generating expectations of future prices (Gigineishvili, 2011). Lack of competition in the banking industry, with relatively inelastic loans demand, may further restrain the transmission process (Mukherjee and Bhattacharya, 2011). In addition, there is a tendency for banks in countries with less developed financial markets to demand more liquidity (Agenor and Aynaoui, 2010), where excessive market liquidity may further weaken the transmission (Sorensen and Werner (2006) and Gigineishvili (2010)).

As for studies in the Islamic banking area, while there are a substantial number of studies around products and business developments, there is a lack of empirical and theoretical studies regarding the issue of the monetary policy transmission mechanism in Islamic banks, in particular in a dual banking system environment where Islamic and conventional banks operate side by side. Zaheer *et al.* (2013) address this matter for Pakistan's case by focusing on the credit view, i.e. the ability of monetary policy to affect banks' loans supply due to market imperfection, and follows Kashyap and Stein (2000) in investigating the cross-sectional differences across Islamic and conventional banks. Nonetheless, there is no study that focuses on the money view in the dual banking system, though in most of the cases, the monetary authority in many jurisdictions are using equivalent *Sharia*-compliant policy instruments when dealing with Islamic banks, thus anticipating similar mechanisms.[29]

This study attempts to bridge the gap by offering a simple theoretical framework to explore how a particular transmission mechanism of monetary policy works on Islamic and conventional banks within a dual banking system. Specifically, how a certain bank asset portfolio, which corresponds to it either being conventional or Islamic, determines the equilibrium rate of return on loans and on deposits which, in turn, affects their loans and net-

[29] Chatta and Halim (2014) conducted a survey on regulator and supervisory agents in countries that offer Islamic financial services and found that around 80% have adapted OMOs and primary market issuance of central bank or government securities for monetary policy purposes in order to accommodate transactions with Islamic banks.

borrowing from the central bank in response to the policy rate. The structure of analysis basically follows Champ *et al.* (2010) in examining the effect of unlimited central bank lending to the economy by altering the effective reserve requirement, with some modifications to accommodate the particular research question of interest.

The "materiality" aspect of Islamic finance explained above and the limited availability of *Sharia*-compliant financial products as a result leads to a marked difference in Islamic banks assets portfolio which corresponds to a consistently higher loan-to-asset ratio in comparison to conventional banks. The chosen theoretical framework of this study focuses on this difference in assets portfolio and provides several testable predictions on comparison of Islamic and conventional banks' responses to central bank policy rate, given the differences in the loan-to-asset ratio across types. These predictions encompass the responses of loans rates as well as deposits rates, bank loans and the net-balance of individual banks in the central bank following monetary operations. The main proposition of the model suggests more muted effects of Islamic banks in comparison to conventional banks due to their larger loan-to-asset ratio. The monetary transmission process works as follows: The policy rate set by the central bank affects banks' retail rates. When there is an increase in the policy rate, banks holding more loans in their assets portfolio, which are then the Islamic banks, do not need to increase their rate of return on loans as much as banks which hold fewer loans in order to satisfy the non-arbitrage condition for the optimal net-borrowing from the central bank. The smaller increase in interest rate, in turn, affects bank loans through demand for loans by firms. Accordingly, banks will adjust their reserves in response to these changes in loans such that their borrowing from the central bank will decrease, in which the decrease is lower in Islamic banks than conventional banks. As for responses of deposit rates, there are no differences in Islamic and conventional banks' responses as long as the non-arbitrage condition is satisfied; it is not dependent on a bank's asset portfolio in this particular set up. These sets of predictions are derived by assuming that each agent only deals with agents from the same types, i.e. Islamic banks with Islamic

customers, and non-Islamic banks with non-Islamic customers. Any slack of this assumption may affect the prediction considerably.

We test this set of predictions empirically using a panel of individual bank data in the Indonesian dual banking system by several sample sets. In accordance to the type-for-type assumption on the theoretical framework, we construct sample sets that allow us to analyse the implication of this particular assumption. In particular, besides treating all of the available Islamic banks data in the economy as one group in the sample, we also use sample sets that exclude Islamic windows, i.e. units of non-Islamic bank which offer Islamic bank services, so that only Islamic full-fledged banks remain.

Indonesia is considered a good case because its Islamic banks cover around one-third of conventional banks in the number of banks, and they are growing rapidly and continuously and increasing in importance. Equally important in regard to the chosen theoretical framework, which imposes a symmetrical mechanism of central bank lending and deposits facilities, is the considerably large amount of the net-balance of the total domestic banking industry at the central bank of Indonesia. This balance, which includes required reserves, reached more than 17% with respect to the industry's total assets in 2007-2012, emphasising the relevance of the theoretical model.[30]

Overall, the results which consider all Islamic banks in one group show no-difference responses to monetary policy across non-Islamic and Islamic banks' rate of return on loans, return on deposit, loans and net-borrowing from the central banks. While we predict this result to hold for rate of return on deposits, the other theoretical predictions are not supported. However, the results change considerably when we use sample sets that exclude Islamic windows. The latter supports almost all of the theoretical predictions, except for banks' loans which continue to show no-difference results and exhibit inelastic loans demand. These changes demonstrate how the results are highly dependent on how well the two types of banks are segregated from each other. The possibility that both types of banks

[30] Though the considerably persistent excess reserve may hamper the monetary policy transmission, study by Mukherjee and Bhattacharya (2011) using panel of emerging countries, in which Indonesia took part, finds promising results on the effectiveness of monetary policy through traditional interest channel in affecting private consumption and private investment.

are sharing their customer base generates arbitrage opportunities that drive prices toward equality across types, may impede the potential difference of non-Islamic and Islamic banks.

The rest of this chapter is organized as follows. Section 2 briefly explains the monetary policy framework and the development of Islamic banking in Indonesia. Section 3 outlines the theoretical model. Section 4 presents the data and the corresponding testable predictions. Section 5 describes the empirical methodology and presents the empirical results. Section 6 concludes with policy implications.

2.2 Monetary Policy Framework and Islamic Banking in Indonesia[31]

The Indonesian central bank, Bank Indonesia, started to adopt the inflation targeting framework in 2005 by pursuing its goal of maintaining price stability. In so doing, Bank Indonesia has the authority to conduct monetary policy by setting the policy rate, BI rate, to influence various rates in the money market and in the banking system, which are, in turn, expected to ultimately influence output and inflation through various transmission channels.

At the operational level of the monetary control, Bank Indonesia has several instruments at its disposal. The first is open market operations where it directly deals with individual banks in the money market through outright purchases or sales of securities (government bonds and central bank certificates) to achieve the interbank rate as the operational target of monetary policy. The second is standing facilities, where it extends lending and deposit facilities with a certain return (BI rate +25 bps and –175 bps for lending and deposits facilities respectively) to individual banks. In general, the stated purpose of standing facilities is to limit the volatility of the interbank rate in the short-run; however, in the longer-run this could also lead to an altering of the effective reserve requirement. The third is the statutory reserve requirement in which individual banks are required to keep a ratio of their deposits in their giro account at Bank Indonesia. Bank Indonesia takes into account these activities, together with government operations and changes in currency

[31] Various sources from www.bi.go.id

outside the banking system to determine how much liquidity should be made available or be absorbed in order to maintain the money market equilibrium that corresponds with the target it sets. In addition to these sets of instruments, Bank Indonesia occasionally also directly regulates credits or bank loans.

The sums of banks' assets portfolios allocated within the central bank, due to engaging in the open market operation and utilizing the deposits facility, could reach up to 20% of total banking assets, which indicates up to around 10% of total assets as excess liquidity after the statutory reserve requirements. Figure 2.2.1 shows that the banking industry total placements at the central bank are always sufficiently in excess of what is mandatory as a reserve requirement,[32] except for a short period from August to October 2008, when the impact of global liquidity crises were being felt during that time. These excess reserves consist of term deposits in the open market operation and deposits facilities with Bank Indonesia.

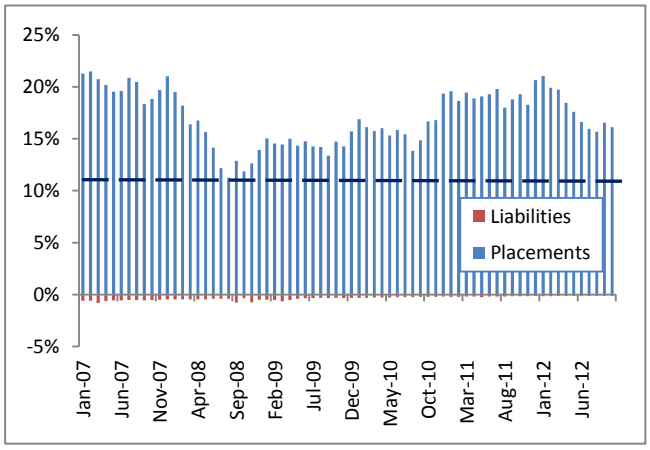

Figure 2.2.1 Ratio of total balances at the central bank to total assets of banking industry (%)

The aforementioned operational activities are conducted through conventional, or non-Islamic, as well as Islamic banks in parallel. In dealing with Islamic banks, the central

[32] The reserve requirement is determined as ratio of reserve to total deposits. During the period of observations, the reserve requirement ratio had changed twice in October 2008 and November 2010. The amount indicated in the figure is an approximation for the whole period.

bank uses *Shari*a-compliant instruments which consist of the *Sharia*-compliant certificate of Bank Indonesia, and deposits and financing facilities, all of which aim to work in similar ways to guide the market towards the target. Currently, Bank Indonesia uses the same target rate on both banking systems.

Indonesia's Islamic banking industry has only been operational since 1992, and the government continues to encourage its growth by issuing supportive regulations and the necessary infrastructure. As one form of support, they have enacted regulation which allows conventional banks to open an Islamic window, a unit that provides Islamic banking services. In addition, one can convert a conventional bank in order to establish a new fully-fledged Islamic bank. During the sample period of this paper, there are many cases of such conversions. One direct consequence of this is that, in the last five years, the Indonesian Islamic banking industry has experienced rapid annual growth of around 50%. Nevertheless, the Islamic banking sector still accounts for a very small proportion of the industry, where total assets amount only up to around 5% of the total industry's assets.

2.3 The Theoretical Framework

The previous section, which briefly explains Indonesian monetary policy operations, indicates that the central bank uses various instruments at its disposal to achieve its target. It is also shown in Figure 2.2.1 that the banking industry keeps a considerably large balance with the central bank in addition to the required reserves by utilizing the standing facilities which constitute lending as well as deposits facility. While the main purpose of the central bank lending is to allow banks to meet the statutory reserve requirements without forcing them to fire-sell their interest bearing assets when they are unexpectedly experiencing a liquidity shortage, it may also be used to affect banks' loanable funds by acting as an alteration of the effective reserve requirement, as in Champ *et al.* (2011). The reverse may also apply to the central bank's deposits facility, though is not necessarily symmetric.

In the following theoretical framework, we will focus on these facilities, i.e. lending and deposits facilities that the central bank uses to influence banks' loanable funds, as explained above. The net banks' balance with the central bank in utilizing these facilities are represented as net bank-borrowing from the central bank by imposing the reverse applies symmetrically. The monetary policy transmission in this economy works through the exogenous central bank's policy rate which, in turn, alters various banks' retail rates and, ultimately, banks' balances at the central banks in order to place loans demands upon them at the prevailing lending rate. The household's portfolio consists of bank deposits and government bonds, so that households do not hold currency. In this set up, deposits are the only form of money, whereas fiat money is held only as reserves. Banks are assumed to be competitive, so that they take all prices as a given, though it is endogenously determined in the equilibrium. The structure of the framework allows the transmission mechanism of monetary policy to feed through several steps which, in turn, determines the lending rate, deposits rate, banks' loans and the net-borrowing or the balances at the central bank.

The framework is a modified version of Champ *et.al* (2011)[33] and Freixas and Rochet (2008)[34] three-period partial equilibrium model of a closed economy.[35] It is assumed that there is no uncertainty in investment outcomes (no default risk) so that the structure of the framework for type I (Islamic) system and type NI (non-Islamic) system are identical and could be represented simultaneously by a single framework with an index i where $i = I, NI$.[36] However, if we abstract from this particular assumption, Islamic banks' equity-based system would be distinct from non-Islamic banks' debt-based system. The purpose of this assumption is to show the potential difference of the two banking systems, even in the absence of default risk.

[33] The original model by Champ et.al (2010), which builds on the work of Romer (1985) and Freeman (1987), employs an overlapping generation in general equilibrium framework for welfare analysis purposes.
[34] In the baseline model of Freixas and Rochet (2008) the role of the bank is solely to provide liquidity insurance as consumers can directly access the illiquid technology, while in this modified model households could not directly invest in capital.
[35] Indonesia is indeed more precisely represented as a small open economy. However, considering the focus of this study, it is simplified to a case of closed economy.
[36] For more accurate terms of Islamic contracts, see Appendix 2.1.

There are seven agents in the economy i.e. banks, households, firms, all for each type; and a central bank.[37] It is assumed that each agent only deals with agents of the same type, except for the central banks which can deal with both types of banks. This is a very strong assumption for an economy with dual banking system since there is no legal restriction that limits a bank to deal only with a particular type of consumer and vice versa. There are other possibilities of customers-banks relations in such economy. Besides customers having relation only with banks of their own type or only with banks from the other type, there may also customers who deal with two different types of bank simultaneously. While the first two cases are relatively straightforward and create a clear segmentation, the third case is more challenging since there could be arbitrage opportunities across types which could impede the potential differences. These opportunities are possibly more prevalent in the case of Islamic windows or units of non-Islamic bank which offer Islamic bank services, since in this case the two types of banks are inter-correlated to each other which may also apply in term of their customer base. Therefore, to account for such condition, besides considering all banks in the economy, the empirical analyses also deal with sample that excludes Islamic windows and only account for fully separated Islamic banks.

Households, who are subject to liquidity shocks, can only deal with firms via banks which are endowed by their capability in creating capital from consumption good.[38] The particular theoretical framework shows that, due to adherent to Sharia principles, which in turn affect depositor liquidity shocks and limit Islamic banks assets portfolios (reflected by parameter ρ and α in the model, respectively), monetary policy that works through central bank lending and deposit facilities deliver different outcomes across bank types.

[37] There is also exists a government who supply government bonds exogenously for each type of agents and use the proceeds to finance government expenditure. However, since inclusion of it does not change the result, it is not explicitly derived in the model.

[38] Indeed there are various reasons of why an intermediary exists, Bhattacharya and Thakor (1991) provides a survey for recent works on financial intermediation. However for simplicity and focus on this paper we restrict with the simplest relation.

2.3.1 The Environment

The following framework takes price p as given and constant so that inflation is zero.[39] For any real value x, X is the nominal value which is equal to px. Table 2.3.1 describes events in each period.

Table 2.3.1 Events in each period

$t = 0$
1. Households of each type are endowed by consumption good and invest in bank deposits and/or government bonds. 2. Banks of each type take consumption good from households as deposit; borrow from the central bank; transform the consumption good into capital to be borrowed by firms.
$t = 1$
1. Households learn their liquidity shocks and if need to consume early they will consume their deposit or liquidate their holding of government bonds at some costs. 2. Banks pay to households which need to consume early by costlessly liquidate their holding of government bonds.
$t = 2$
1. Households, which have not done so, consume their deposit in banks. 2. Banks pay to the rest of the households; get paid from firms; and pay the central bank for the borrowing.

2.3.1.1 Households

Households of each type live for three periods. In the first period, at time $t = 0$ households are homogenously endowed with y^i consumption good, the only good available in the economy, but need to consume at time $t = 1$ or $t = 2$. In ex ante terms households are identical, besides being type I or NI, however at time $t = 1$ household of each type learn whether they will have to consume early (impatient) or late (patient). In the case of consuming early their utility is $u(c_1^i)$, while for consuming late their utility is $u(c_2^i)$, where c_j denotes consumption in time j-th. The utility function is strictly concave and strictly increasing in every argument. Households at time $t = 0$ can choose to save by holding

[39] We follow Bernanke and Blinder (1988), and more recently Agenor and Aynaoui (2010), in suppressing inflation rate so that nominal gross rate of return is equal to real gross rate of return.

deposits in banks H^i which gives a gross return of i_{D1}^i or i_{D2}^i at time $t=1$ or $t=2$ respectively, or by holding two-periods government bonds B_H^i with gross return of i_G^i at time $t=2$. There exists a secondary market for government bonds which households can access with some cost, so that at $t=1$ the gross return for government bonds is $i_G^i-\varepsilon$, where ε is a positive number. All gross returns are greater than one.

The household's problem in an ex-ante viewpoint:

$$\underset{c_1^i,c_2^i}{Max}U=\rho^i u\left(c_1^i\right)+\left(1-\rho^i\right)u\left(c_2^i\right) \tag{3.1}$$

where ρ^i is the probability of early-consuming and $\left(1-\rho^i\right)$ is of late-consuming, subject to the second and third period budget constraints:

$$\rho^i pc_1^i=i_{D1}^i H_1^i+\left(i_G^i-\varepsilon\right)B_{H1}^i \tag{3.2}$$

$$\left(1-\rho^i\right)pc_2^i=i_{D2}^i H_2^i+i_G^i B_{H2}^i \tag{3.3}$$

where $py^i-\left(H_1^i+B_{H1}^i\right)=H_2^i+B_{H2}^i$; $H^i=H_1^i+H_2^i$; $B_H^i=B_{H1}^i+B_{H2}^i$ and that H_1^i and B_{H1}^i are respectively withdrawn deposits at $t=1$ and government bonds that traded in the secondary market at $t=1$, while H_2^i and B_{H2}^i are withdrawn deposits at $t=2$ and government bonds which are held to maturity.

Hence in this framework, the difference in utility of I and NI households is only captured by the probability of consuming early or late.

2.3.1.2 Firms

At time $t=0$, one unit of capital can be created by banks in a form of business loans to firms from every unit of the consumption good that is held as deposits in banks. Further, each k^i unit of capital, which is acquired in the first period, is used by profit maximizing firms to produce $f(k^i)$ units of consumption good in the third period, with diminishing marginal product[40]. All capital at the third period is used up in the production process.

The firm's problem is to maximize profits as the following:

$$\max_{k^i}\pi_F^i=f\left(pk^i\right)-r_L^i pk^i \tag{3.4}$$

[40] This is necessary for the unlimited central bank standing facilities to have a unique equilibrium.

with $f'(k^i) > 0$ and $f''(k^i) < 0$

where r_L^i is the real gross return of capital which is equal to i_L^i the nominal cost of capital that have to be paid to banks for each unit of capital.

Hence, both types of firms are assumed to have identical production function.

2.3.1.3 Banks

Banks of each type maximize their profits by issuing deposits H^i with gross rate of return i_{D1}^i or i_{D2}^i at time $t=1$ or $t=2$ respectively, holding business loans K^i and government bonds or securities B_B^i as their assets with gross rate of return of i_L^i and i_G^i respectively.[41] All returns are taken as given for banks, though endogenously determined in equilibrium. All securities and loans are default free and have a maturity period of two, i.e. assets acquired in the first period will be mature in the third period. It is further assumed that each type of bank can only hold assets or liabilities of their own type.[42] In addition, both types of banks are required to hold a certain share of their deposits as reserve requirement γ along the three periods, in a form of fiat money F^i, which has gross return equal to one. In order to meet this reserve requirement, at time $t=0$ banks are allowed to borrow a fraction δ^i of the reserve requirement from the central bank at a determined two-periods gross rate of return i_{CB} which exogenously given as the policy rate.[43] Hence, a negative value of δ^i indicates that banks are actually maintaining positive balances at the central bank in excess of reserve requirement.[44] As this structure works symmetrically, while the rest of the description only stated as borrowing from the central bank, the mechanism also encompasses

[41] For simplicity it is assumed that securities are consisted by government bonds only so that the terms are used interchangeably.

[42] In the actual implementation Islamic banks are indeed restrained from holding assets/liabilities of conventional financial products - in Indonesia this is restricted by a formal act (Act of the Republic of Indonesia No. 21 of 2008 Concerning Sharia/Islamic Banking) – but not vice versa. In particular, though conventional banks cannot offer Islamic financial products, but they may hold Islamic securities. However, for simplicity we assume complete separation.

[43] In dealing with Islamic banks, sharia-compliant contract is used. In the case of Indonesia, the central bank use profit-loss sharing contract, *mudharaba*, where the sharing ratio is set equivalently to meet the policy rate.

[44] In real practice, there is a spread in the rate of return of lending (borrowing) and deposits (placement) facility to the policy rate, see Section 2.2.

placement or deposits at the central bank.[45] For simplicity, banks are assumed to have zero net worth.[46] The balance sheet of a bank would look as in Table 2.3.2.

Table 2.3.2 Balance sheet of a type i bank

Assets		Liabilities	
Reserves	$(\gamma)H^i$	Deposits	H^i
Business loans	$\alpha^i\left(1-\gamma\left(1-\delta^i\right)\right)H^i$	Borrowing from central bank	$\left(\gamma\delta^i\right)H^i$
Securities	$\left(1-\alpha^i\right)\left(1-\gamma\left(1-\delta^i\right)\right)H^i$	Net worth	0
Total	$\left(1+\gamma\delta^i\right)H^i$	Total	$\left(1+\gamma\delta^i\right)H^i$

Loans gross returns exceed gross returns on securities, and the latter in turn exceed the unity gross return on fiat money. However, it is assumed that a secondary market is only available for securities but not for loans so that loans acquisitions and disposals could be executed only at the beginning of the first period. In addition, unlike households, banks could perfectly access the secondary market at no cost. The percentage of banks assets aside from reserve requirement that is invested in loans or capital is α^i. Further, banks at time $t=0$ are assumed to perfectly anticipate early withdrawals of the liquidity pool at time $t=1$, or in other words banks could perfectly observe probability ρ^i and there exist mechanisms which ensure no coordination failure so that the patient household always wait for time $t=2$.

The bank's problem is to choose the amount of deposits it is willing to undertake and the amount of borrowing from the central bank in order to maximize the three-period profits as in the following:

$$\max_{H^i,\delta^i} \pi_B^i = \left(\left(1-\gamma+\gamma\delta^i\right)\left(\alpha^i i_L^i+\left(1-\alpha^i\right)i_G^i\right)+\left(\gamma-\gamma\delta^i i_{CB}\right)-\left(\rho^i i_{D1}^i+\left(1-\rho^i\right)i_{D2}^i\right)\right)pH^i \quad (3.5)$$

subject to

$$F^i+K^i+B_B^i=H^i \quad (3.6)$$

$$\alpha^i=\left(1-\rho^i\right) \quad (3.7)$$

[45] This is somewhat different from Agenor and Aynaoui (2010) who considers asymmetric effect of excess liquidity, which in their model is defined as involuntary excess reserves of cash in vault.

[46] As we will see later, the assumption of no default on loans and securities and banks' ability to offer optimal deposit contract in which liquidity shocks are perfectly diversifiable entails no bank capital or equity is needed.

The objective function (3.5) is linear in H^i so that the size of each individual bank is indeterminate so that bank decisions do not affected by their size and that bank makes zero profits in equilibrium. The first term inside the bracket of the RHS is the return earned from investing in loans and bonds, the second term is the return from holding reserves net any cost for borrowed reserves, and the last is the cost from issuing deposits that must be paid to households as depositors. Constraint (3.6) is the balance of bank balance sheet. Constraint (3.7) is the maturity-match condition which allows banks to perfectly diversify liquidity shocks. In this framework, parameter α^i and ρ^i are the source of differences between type I and NI .[47]

2.3.1.4 The Central Bank

The central bank fully elastically supplies two-period central bank loans (deposits), as banks' borrowed (excess) reserves at the determined policy rate to both types of banks, and non-borrowed reserves of fiat money M^i .[48] In this theoretical framework, since the purpose is solely to analyse the effect of policy rate to both types of banks, there is no explicit policy rule of the central bank so that the policy rate is determined exogenously.

2.3.2 The Equilibrium

From the household's problem, in order for households to be indifferent of holding both types of assets, the two must give the same gross rate of return, so that:

$$i_{D1}^i = i_G^i - \varepsilon \tag{3.8}$$

$$i_{D2}^i = i_G^i \tag{3.9}$$

At the rate of return in (3.8) and (3.9), the optimal allocation that satisfies the first order condition:

$$i_{D1}^i u'\left(c_1^{i*}\right) = i_{D2}^i u'\left(c_2^{i*}\right) \tag{3.10}$$

[47] Later on for the testable predictions, α^i is calibrated from the data.

[48] Because nominal deposits are the only form of money, fiat money is held only as reserves. Following the original model of Champ *et al*. (2011) the borrowing from the central bank acts as an alteration of the effective reserve requirement, rather than as short-term liquidity purposes.

Equation (3.10) show that the relative return of deposits at times 2 and 1 equates the marginal rate of substitution between consumption at dates 2 and 1.

From the firm's optimal condition we have marginal product of capital equates the cost of capital:

$$f'\left(k^i\right) = r_L^i \tag{3.11}$$

Equation (3.11) is the firms' demand curve for bank loans which is decreasing in the rate of return on loans, so that an increase in rate of return on loans will reduce the demand for loans.

The first order condition in the bank's problem with respect to H^i is the banks' zero profit condition:

$$\left(1-\gamma+\gamma\delta^i\right)\left(\alpha^i i_L^i + \left(1-\alpha^i\right)i_G^i\right) + \left(\gamma-\gamma\delta^i i_{CB}\right) - \left(\rho^i i_{D1}^i + \left(1-\rho^i\right)i_{D2}^i\right) = 0 \tag{3.12}$$

Equation (3.12) ensures that banks have zero profit in equilibrium.

From the first order condition of the bank's problem with respect to δ^i we have the non-arbitrage condition for optimal borrowing from the central bank:

$$i_{CB} = \alpha^i i_L^i + \left(1-\alpha^i\right)i_G^i \tag{3.13}$$

This condition implies that banks would be willing to borrow from the central bank as long as the cost of borrowing is not greater than the weighted return that banks received from placing the proceed in their investment portfolio, i.e. in loans and bonds. The zero profit condition implies that these costs and returns are equalized. This intuition applies in the case of positive δ^i. For a negative value, (3.13) implies that for banks to be willing to place a fraction of their loanable fund in the central bank, the return from this placement is not lower than the weighted return of their portfolio in loans and bonds. Likewise, as banks make zero profit in equilibrium, these terms are equalized.

Substituting the maturity-match constraint (3.7), non-arbitrage condition (3.13) in to (3.12) we have redefined the gross return equalities in (3.8) and (3.9) to the following:

$$i_{D1}^i = i_G^i - \varepsilon = i_G^i - \gamma\left(i_G^i - 1\right) \tag{3.14}$$

$$i_{D2}^{i} = i_{G}^{i} = i_{L}^{i} - \gamma\left(i_{L}^{i} - 1\right) \tag{3.15}$$

From (3.14) and (3.15) we can see that part of return from government bonds and loans are foregone for holding reserve requirement in fiat money which gives zero return, or gross rate of return equal to one. To make households indifferent between holding government bonds and deposits, the cost in entering the secondary market for households equalize banks' foregone return for holding fiat money. Thus, in this set up the role of banks is simply to make capital accessible for households.

To close the framework's model we need market clearing conditions for deposits, business loans, government bonds and fiat money as the following.[49] From the optimal allocation of the household problem in (3.10) we have the supply of deposit which is taken as given by bank which in turn invests it in various forms of assets as in (3.6). The market clearing for deposits is:

$$py^{i} - B_{H}^{i} = H^{i} = F^{i} + K^{i} + B_{B}^{i} \tag{3.16}$$

where the term on the LHS of H^{i} is the amount of households' endowment that is invested as deposits and the term in the RHS is the balance of bank balance sheet as (3.6).

From the firms' optimal condition in (3.11) and rearranging terms we have the demand for business loans and the supply of loans from banks problem which satisfies balance of banks' balance sheet condition (3.6) and the maturity-match condition in (3.7):

$$pk^{i}\left(r_{L}^{i}\right) = \alpha^{i}\left(1 - \gamma + \gamma\delta^{i}\right) pH^{i} \tag{3.17}$$

where $k^{i}(.)$ is a diminishing decreasing function.

The supply of government bonds is exogenous and equals the demand for it by households and banks of each type:

$$\overline{B}^{i} = B_{H}^{i} + B_{B}^{i} \tag{3.18}$$

Finally, the central bank elastically supplies total fiat money for borrowed and non-borrowed reserves which is demanded by both types of banks:

[49] We also need the government budget constraint in order to clear the market of consumption goods or to obtain the feasible sets, see footnote 37. For derivation of the government budget constraint see Appendix 2.2.

$$\sum_i F^i = \sum_i \gamma \delta^i H^i + \sum_i M^i \tag{3.19}$$

The LHS of (3.19) is the total demand for fiat money, which in this case is equal to $\sum \gamma H^i$, the total demand for reserves. The RHS of (3.19) is the total supply of fiat money where the first term is the borrowed reserves and the second term is the stock of fiat money as non-borrowed reserves. Hence, the market clearing for money in (3.19) is automatically satisfied if the other market clearing conditions in (3.16), (3.17) and (3.18) are satisfied since money is the numeraire.

2.3.3 Transmission Mechanism of Monetary Policy

For simplicity, the analysis of the transmission mechanism of monetary policy is restricted to an equilibrium in which households put all of their endowment as bank deposits. Any other interior equilibrium would not change the general results.[50] The transmission mechanism of the monetary policy in this model works in the following sequence:[51]

1. The central bank determines the policy rate i_{CB}.
2. This drives other assets returns to adjust:
   a) Rate of return of business loans is determined from gross return equality in (3.15) and non-arbitrage condition (3.13) given the i_{CB} from Step 1:

$$i_L^i = \frac{i_{CB} - \gamma\left(1-\alpha^i\right)}{1-\gamma\left(1-\alpha^i\right)} \tag{3.20}$$

   b) Rate of return of government bonds is determined from the rate of return equality condition in (3.15) at the prevailing i_L^i from (3.20).
   c) The weighted average rate of return of deposits $i_D^i = \left(1-\alpha^i\right)i_{D1}^i + \alpha^i i_{D2}^i$ where i_{D1}^i is the return of early withdrawal at $t=1$ and i_{D2}^i is the return of deposits is at $t=2$, is determined for a given $\alpha^i = \left(1-\rho^i\right)$ at the prevailing i_L^i and i_G^i.

[50] We rule out the case of the other corner of non-deposits equilibrium since in that particular case banks would not exist.
[51] These steps resemble, though in a more simplistic manner, the transmission mechanism suggested by Goodhart (2002) which shows that bank reserves is actually determined in the end of the transmission.

3. Firms determine the volume of business loans they wish to undertake through demand for business loans as in the LHS of (3.17) at the prevailing i_L^i.

4. Given the demand for business loans from Step 3 and the corresponding level of deposits with the supply of loans in (3.17), banks determine how much fraction of the reserve to be borrowed from the central bank:

$$\delta^i = \frac{pk^i\left(r_L^i\right) - \alpha^i(1-\gamma)py^i}{\gamma\alpha^i py^i} \tag{3.21}$$

Equation (3.21) is key for this particular transmission mechanism of interest, because it reflects how the policy rate ultimately determines the ratio of borrowed reserve requirement, or in other words banks' utilization of central bank standing facilities, through the above sequence.

2.3.4 Comparative Statics

Before deriving the comparative statics of the effect of monetary policy, we make some predictions on the level of banks' rate for a given banks portfolio α^i. By taking the first derivative of the derived equilibrium conditions in the previous section with respect to α^i we can predict that banks with larger α^i have lower i_L^i as long as the net i_{CB} is positive. The intuition is that banks which hold higher ratio of loans in their asset portfolio do not need their lending rates to be as high as banks with lower ratio of loans in order to meet the non-arbitrage condition in (3.13). For the weighted average rate of return on deposits, i_D^i, it is not affected by banks' assets portfolio. As long as (3.13) is satisfied, any portfolio entails equal i_D^i for a given i_{CB}. The demand for bank loans is not directly affected by α^i but it is affected through the lending rate i_L^i. Since non-Islamic banks have higher i_L^i, thus for the same demand function their loans will be less than Islamic banks'. The net-borrowing from the central bank δ^i will be higher for a higher α^i. As banks with higher α^i charge lower i_L^i and in turn have higher loans, they will also need to borrow more from the central bank in order to meet the demand for loans upon them.

In the next analysis, we derive how increase in i_{CB} affect the endogenous variable as given in Step 2 to Step 4 of the transmission mechanism of monetary policy for a given banks portfolio α^i. The following predictions outline the response of banks given their different assets portfolio.

Prediction on rate of return on loans

Increase in policy rate leads to an increase in rate of return on loans in which the type of banks that have larger loan-to-asset ratio will experience a smaller increase.

From (3.20) we have that:

$$\frac{\partial i_L^i}{\partial i_{CB}} = \frac{1}{1-\gamma\left(1-\alpha^i\right)} > 0 \qquad (3.22)$$

The increase in i_{CB} will increase i_L^i more than proportionately, in order to satisfied the non-arbitrage condition in (3.13), because some part of the rate of return on loans are foregone for holding the required reserves. The higher the required reserves γ, the higher is the increase in i_L^i implying the more banks need to be compensated for the foregone returns.

For the responses to changes in i_{CB} with respect to value of α^i:

$$\frac{\partial}{\partial \alpha^i}\left(\frac{\partial i_L^i}{\partial i_{CB}}\right) = \frac{-\gamma}{\left(1-\gamma+\gamma\alpha^i\right)^2} < 0 \qquad (3.23)$$

Banks which hold more loans in their assets portfolio do not need to increase their rate of return on loans as much as banks which hold fewer loans in order to satisfy the non-arbitrage condition.

Prediction on rate of return on deposits

Increase in policy rate leads to an increase in the weighted average rate of return on deposits which is independent to the value of loan-to-asset ratio.

From (14) and (15) and the average rate of return on deposits $i_D^i = \left(1-\alpha^i\right)i_{D1}^i + \alpha^i i_{D2}^i$:

$$\frac{\partial i_D^i}{\partial i_{CB}} = \frac{\partial i_D^i}{\partial i_{D1}^i}\cdot\frac{\partial i_{D1}^i}{\partial i_{CB}} + \frac{\partial i_D^i}{\partial i_{D2}^i}\cdot\frac{\partial i_{D2}^i}{\partial i_{CB}} = \frac{\left(1-\gamma\right)\left(1-\gamma\left(1-\alpha^i\right)\right)}{1-\gamma\left(1-\alpha^i\right)} = \left(1-\gamma\right) > 0 \qquad (3.24)$$

The increase in i_{CB} will increase i_D^i less than proportionately, implying incomplete pass-through, because not all of the deposits can be invested due to reserved requirement. According to (3.24), higher γ would dampen the pass-through.

For the responses to changes in i_{CB} with respect to value of α^i :

$$\frac{\partial}{\partial \alpha^i}\left(\frac{\partial i_D^i}{\partial i_{CB}}\right) = 0 \tag{3.25}$$

Equation (3.25) implies that as long as the non-arbitrage condition is satisfied, the average rate of return on deposits is independent to banks assets portfolio.

Prediction on bank loans

Increase in policy rate leads to a decrease in loans in which type of banks that have larger loan-to-asset ratio will experience a smaller decrease.

Given the assumption that the firms technology $f\left(k^i\right)$ are the same across type, then the demand curve for loans $k\left(r_L^i\right)$ are also the same across type. From Prediction 1, since i_L^i is increasing with i_{CB} where $i_L^i = r_L^i$, so that:

$$\frac{\partial k^i}{\partial i_{CB}} = \frac{\partial k^i}{\partial r_L^i}\frac{\partial i_L^i}{\partial i_{CB}} < 0 \tag{3.26}$$

As shown in (3.22) that the increase in i_{CB} will increase i_L^i so that the loans provided will decrease because demand for loans is decreasing in i_L^i as in (3.11).

For the responses to changes in i_{CB} with respect to value of α^i :

$$\frac{\partial}{\partial \alpha^i}\left(\frac{\partial k^i}{\partial i_{CB}}\right) = \frac{\partial}{\partial \alpha^i}\left(\frac{\partial k^i}{\partial r_L^i}\right)\frac{\partial i_L^i}{\partial i_{CB}} + \frac{\partial k^i}{\partial r_L^i}\frac{\partial}{\partial \alpha^i}\left(\frac{\partial i_L^i}{\partial i_{CB}}\right)$$

$$= 0.\frac{1}{1-\gamma+\gamma\alpha^i} + \frac{\partial k^i}{\partial r_L^i}\cdot\frac{-\gamma}{\left(1-\gamma+\gamma\alpha^i\right)} \tag{3.27}$$

The first term in the RHS of (3.27) is zero since firms demand for loans do not depend on banks' asset portfolio, α^i. This implies that any difference in k^i would be brought by differences in i_L^i across the two types of banks. The second term in the RHS implies that

since the increase in i_L^i of bank with larger α^i is smaller, then the decrease in k^i will be smaller in comparison to banks with lower α^i.

Prediction on net-borrowing from the central bank

Increase in policy rate leads to a decrease in net-borrowing from central bank in which the type of banks that have larger loan-to-asset ratio will experience a smaller decrease.

From (3.21) together with Prediction 2 and Prediction 3 where $i_L^i = r_L^i$, we have that:

$$\frac{\partial \delta^i}{\partial i_{CB}} = \frac{\partial \delta^i}{\partial k^i} \cdot \frac{\partial k^i}{\partial r_L^i} \cdot \frac{\partial i_L^i}{\partial i_{CB}} = \frac{1}{\gamma \alpha^i y^i} \cdot \frac{\partial k^i}{\partial r_L^i} \cdot \frac{1}{1-\gamma\left(1-\alpha^i\right)} < 0 \qquad (3.28)$$

Increase in i_{CB} will increase i_L^i which will further reduce k^i. The effect of k^i on δ^i is positive so that increase in i_{CB} will ultimately reduce δ^i. This effect is inversely related to γ and α^i as shown in the first term of the RHS. The intuition is somewhat straight forward, i.e. the higher is the value of these two parameter, the less is the ratio of borrowed reserve requirement δ^i, that need to be borrowed from the central bank for a given level of bank loans.

For the responses to changes in i_{CB} with respect to value of α^i:

$$\frac{\partial}{\partial \alpha^i}\left(\frac{\partial \delta^i}{\partial i_{CB}}\right) = \frac{\partial}{\partial \alpha^i}\left(\frac{\partial k^i}{\partial r_L^i}\right)\frac{1}{\gamma \alpha^i y^i\left(1-\gamma+\alpha^i \gamma\right)} + \frac{\partial k^i}{\partial r_L^i} \cdot \frac{\partial}{\partial \alpha^i}\left(\frac{1}{\gamma \alpha^i y^i\left(1-\gamma+\alpha^i \gamma\right)}\right)$$

$$= 0 + \frac{\partial k^i}{\partial r_L^i} \cdot \left(\frac{-\gamma y^i\left(1-\gamma+2\gamma\alpha^i\right)}{\left(\gamma \alpha^i y^i - \gamma^2 \alpha^i y^i + \gamma^2 \alpha^{i2} y^i\right)^2}\right) > 0 \qquad (3.29)$$

Banks with larger α^i will decrease their borrowing from central bank less than banks with smaller α^i, because they still need more funds to service their loans which is experiencing a smaller drop in comparison to banks with lower α^i as shown in the previous Prediction 3.

In general, the framework predicts that monetary policy that works through this particular channel will be more effective on banks that have lower α^i.

2.4 Data and Testable Predictions

2.4.1 Data

The data source is the monthly bank reports to the central bank of Indonesia (Bank Indonesia, 2007-2012b) which is an obligatory report for every bank. Generally, the period covered is from January 2007 to October 2012, except for rate of return on deposits and rate of return on loans the starting period is from January 2008. The sample considers 160 commercial banks, of which 121 are non-Islamic banks, 11 are full-fledged Islamic banks, and 28 are Islamic windows or units of non-Islamic bank which offer Islamic bank services. This data set comprehensively includes all commercial banks which are operating in the period of observations. The sample of non-Islamic banks includes government banks, regional development banks and private banks, while the full-fledged Islamic banks are all private banks. The Islamic windows includes unit of government banks, regional development banks and private banks. For cases of mergers and acquisition, the newly formed bank has the same identity number as the main bank. For cases of conversions, the same number of identity is used but with a different value in the NI dummy variable. In order to account for some adjustments that correspond with conversion case, we adjust the sample by excluding several months after each conversion to allow for the newly converted bank to have new customer base. The panel is unbalanced, since there are some bank closures during the period of observations.

The policy rate, or a measure of stance of monetary policy, is the announced central bank rate or BI-rate, which is agreed at Board of Governor monthly meetings. Figure 2.4.1 shows that the policy rate is actually decreasing over time. This condition does not alter the results, since difference-in-differences estimation assumes a symmetrical response.[52] We consider a cut-off level of 6.5%, in which a policy rate above this level is considered as high, or a cut-off period of August 2009.[53] This cut-off point is based on the consideration that it is the start of the new Board of Governors, which was implementing an accommodative (lower

[52] Alternatively, we could put negative sign for the treatment.
[53] There was a slight increase of 25 bps in the policy rate during the period of February to September 2011. However, the results were generally consistent.

policy rate) and relatively passive (less volatile) monetary policy during the rest of the observation periods. This cut-off level is also supported by a significant breakpoint test during the same particular period.[54]

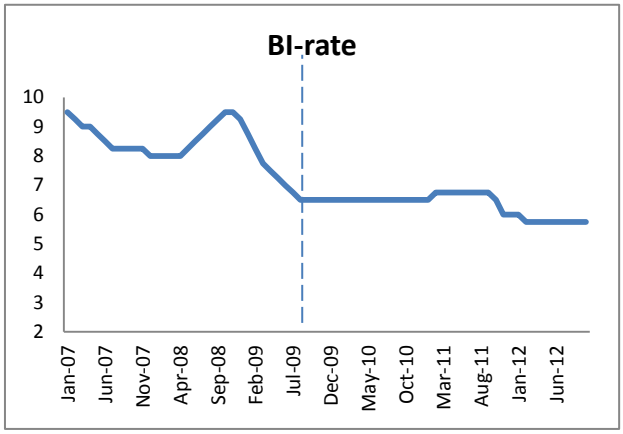

Figure 2.4.1 Bank Indonesia policy rate (BI rate in %)
Source: Bank Indonesia Statistics, www.bi.go.id

For banks' individual characteristics, we include equity, cash holdings, interbank placements and liabilities, and loss provisions as control variables. The equity data for Islamic window banks is the net- inter-branch balance between the Islamic unit and its main non-Islamic office. The data for loans of non-Islamic banks is the total loans that include working capital, consumption loans and investment or business loans. As for Islamic banks, the total loans variable includes all the available financing contracts that consist of leasing, trade financing, partnership, etc.[55] The data for rate of return on loans of non-Islamic banks is the weighted average of interest rates on the three types of loans, while the Islamic banks include the percentage of received shared-profits and the percentage of a fixed-margin.[56]
The data for return on the deposits of non-Islamic banks are weighted average interest rates on current accounts, saving accounts and time deposits, while for Islamic banks it is the weighted average of the percentage of the realised or actual shared-profit to savings accounts and time deposits, which is calculated ex-post by individual Islamic banks, and the

[54] A Chow breakpoint test is conducted on time series estimation on total loans of both types of banks with the policy rate.
[55] Hasan and Lewis (2007) provides excellent survey on Islamic banking products and operations.
[56] Though in principles the main characteristic of Islamic financial contract is profit- and-loss sharing contract, there are also mark-up based contracts which are usually used for trade and lease activities.

percentage of voluntary return (grants) that is given on current accounts. To generate the series for the net-borrowing from the central bank, the data of placements at Bank Indonesia is deducted from the liabilities to Bank Indonesia for each individual bank. These placements include balances at the giro account and any balance in the deposits facility, whereas the liabilities include the lending facility from Bank Indonesia and other liabilities. The summary statistics are outlined in Table 2.4.1.

Table 2.4.1 shows that the average data of rate of return on loans, *Rloans*, supports the framework's static prediction where the average for all Islamic is 13.29% slightly lower than the one of non-Islamic banks at the mean of 13.96%. However, if we exclude Islamic windows the reverse is true where the average *Rloans* of full-fledged Islamic banks reaches 16.17%. This could be a sign that full-fledge Islamic banks may have higher intermediary cost than Islamic windows. The possibilities that the latter may have been enjoying informational advantages provided by their non-Islamic main office in terms of loans screening, for the case of common debtors, could be one of the factor that contributes to the lower intermediary cost of Islamic windows in comparison to the full-fledged Islamic banks. However, the data shows that on average Islamic banks, both full-fledged and windows, are paying higher return to their depositors, *Rdep*, in comparison to non-Islamic banks in general whereas the framework predicts equal deposit rates. For the level of loans in log values, *Lloans*, the average of full-fledge Islamic banks is slightly higher than non-Islamic banks despite that they charge higher *Rloans*. This could be an indication that their borrowers are different and may have religious motive as in Khan and Khanna (2012). As for the net-borrowing from the central bank, *NCB*, in support with the static prediction, Islamic banks borrowed more funds from (or placed less funds in) the central bank. The negative value for net-borrowing from the central banks indicates that most of the banks are actually a net-lender to the central banks, i.e. they have placement in the central bank in addition to the required reserve ratio in which these extra positions are entitled to a certain return tied-up to the policy rate as explained previously.

Table 2.4.1 Summary Statistics

Dependant variables	Non-Islamic banks				Islamic banks			
	All		Private[a]		All		Full-fledged[b]	
	Mean[c]	Stdev	Mean[d]	Stdev	Mean	Stdev	Mean	Stdev
Rdep	5.88***/***	2.07	6.33	2.11	7.67	6.81	6.23	2.62
Rloans	13.96***/***	4.04	14.08***	4.59	13.29	4.98	16.17	4.51
Lloans	6.37***/	0.88	6.24***	0.91	5.55	1.10	6.41	0.74
NCB	-21.96***/***	14.39	-21.29***	14.31	-12.51	14.72	-14.33	9.05
Control variables								
CAR	17.09***/	19.46	19.91	21.98	36.16	23.71	18.69	15.58
KAR	1.81***/***	1.75	1.13	0.92	1.12	2.45	1.11	0.81
NIB	3.32***/***	13.09	1.79***	13.69	10.96	21.31	-2.71	8.01
LLP	1.89	3.95	1.96	4.56	1.89	2.65	1.83	1.20
Lequity	5.81***/**	0.73	5.73	0.73	5.06	1.09	5.73	0.37
Lcash	4.66***/***	0.99	4.36**	0.90	3.56	0.97	4.45	0.88
Lsecurities	3.91***/***	2.60	3.82***	2.57	2.25	2.49	4.65	1.75
Lintbanka	5.29***/***	1.17	5.08***	1.21	4.16	1.52	4.75	0.97
Lintbankp	4.75***/***	1.63	4.67***	1.72	3.23	2.04	4.98	1.11
Others								
LAR	56.48***/***	16.85	57.56***	17.66	87.80	34.65	81.66	24.49
TDD	56.20/***	24.01	65.75***	18.90	55.60	23.28	70.02	16.92
Assets	22044	57464	13059	23527	2531	6286	9270	11498

Descriptions	
Rdep	Rate of return on deposits (%)
Rloans	Rate of return on loans (%)
NCB	Net borrowing from the CB to total assets (%)
CAR	Equity to total assets (%)
KAR	Cash to total assets (%)
NIB	Net-interbank to total assets (%)
LLP	Loss provisions to total assets (%)
Lintbanka	Interbank placement (log)
Lintbankp	Interbank liabilities (log)
LAR	Loans to total assets (%)
TDD	Time deposits to total deposits (%)
Assets	in billions IDR

Notes: a) Excludes government and regional banks.
b) Excludes Islamic windows (Islamic full-fledged banks are all privately-owned banks).
c) Mean test of All Non-Islamic banks to All Islamic/Full-fledged banks.
d) Mean test of Private Non-Islamic banks to Islamic Full-fledged banks
The difference between mean value of Non-Islamic and Islamic banks that is significant at 1%, 5% and 10% are marked with ***, **, and * respectively.
Lx is x (billions IDR) in log values.

The next large difference is shown by loan-to-asset ratio, *LAR*, where Islamic banks' average value reaches 87.8% and 81.66% for samples that includes and excludes Islamic windows respectively, significantly higher than 56.48% and 57.56% for the average of all and privately-owned non-Islamic ones, respectively. We will return to this observed difference below. The largest difference between overall non-Islamic and Islamic banks is the ratio of net-interbank to total assets (3.32% and 10.96% for all non-Islamic and all Islamic banks, respectively). Nevertheless, though *NIB* of all Islamic banks is more than double all non-Islamic banks', we could not directly imply that there is a consistent difference in this variable since the value is changing considerably if we exclude Islamic windows from the sample and only consider Islamic full-fledged banks. On the other hand, the average of variable *LAR* seems to be reflecting a more consistent difference of the two types of banks across sample-sets.

The large difference of *LAR* between non-Islamic and Islamic banks is due to several factors that relate to the Islamic finance principle and, in turn, to the Indonesian Islamic banking condition.[57] First, due to Islamic finance principles, Islamic banks' treasury units do not have extensive involvement in money as well as assets markets. Their activity is limited to supporting the basic liquidity requirement rather than speculative motive. Second, there are very limited *Sharia*-compliant securities available, even though a high demand exists. This is due to problems in originating *Sharia*-compliant securities, which are related to issues such as assets re-tradability and pricing.[58]

One particularly interesting aspect of *LAR* is that banks' liquidity conditions are sometimes associated with their size, where smaller banks tend to be more liquid (Kashyap and Stein, 1994).[59] However, here we find that Islamic banks, full-fledged and windows,

[57] These phenomena are not solely endured by Indonesian Islamic banking sector but also in other jurisdictions. According to the IFSB (Islamic Financial Service Board) publication on Guiding Principles of Liquidity Risk Management in March 2012, the arduous of liquidity risk management of Islamic banks is ubiquitous and the potential for cross-border or regional management of liquidity risk is even harder to achieve due to varying views on *Sharia* compliance and lack of securitisable assets for benchmark issues.

[58] According to some interpretation of *Sharia* law, Islamic securities shall be used for purely investment motive so that it shall be held to maturity or for a minimum fixed period and it is only can be traded for its face value. Nevertheless, there exist diverging *Sharia* views across jurisdiction.

[59] The liquidity condition is measured as ratio of securities to total assets or the opposite of our model definition of *LAR*.

exhibit higher *LAR* irrespective of their size, i.e. they have higher *LAR* in comparison to their non-Islamic counterparts of a similar size. In addition, this observed difference is consistent across time, i.e. Islamic banks always exhibit higher *LAR* than non-Islamic banks during observation periods, as in Figure 2.4.2. Hence, *LAR* could be a good candidate to calibrate the theoretical framework in distinguishing between the two types of banks.

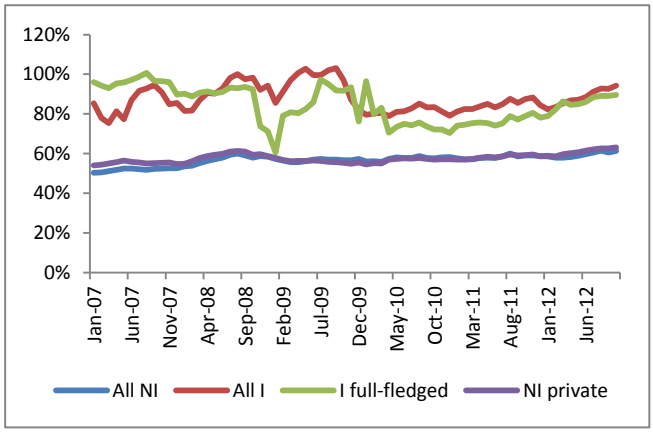

Figure 2.4.2 Sample-averages Loan-to-Asset ratio (%)

If we refer back to the theoretical framework in Section 2.2.3, this *LAR* data corresponds to parameter α^i which in turn reflects the probability of late-consuming households $\left(1-\rho^i\right)$ by the maturity-match constraint. In the equilibrium where efficient allocation is reached, these two terms should be identical; otherwise the liquidity risks would persist. In actual banking operations, maturity mismatch is ubiquitous requiring certain capital buffers and some extension of liquidity reserves. Indeed, Table 2.4.1 shows that in general Islamic banks do maintain higher capital-to-asset ratio in comparison with the non-Islamic banks, which are 36.16% and 17.09% for all Islamic banks and all non-Islamic banks respectively. However, if we look at the sub-sample of full-fledged Islamic banks the difference is no longer significant, which implies that the Islamic windows are the ones who actually maintain higher *CAR*.

On the other hand from the depositors' viewpoint, theoretically, Islamic finance principles shall also hold for households of Islamic type. This condition entails a larger share of late-consuming households in comparison to non-Islamic type since financial investment

should be based on a real investment motive which requires households to hold their financial investment to maturity, as similarly suggested by Khan and Khanna (2012). In the theoretical framework the probability of patient households $\left(1-\rho^{i}\right)$ can be approximated by the ratio of time deposits to total deposits at the banks, *TDD*. Interestingly, the data show that on average, Islamic and non-Islamic banks have fairly similar values of *TDD*, which are 55.6% and 56.19% respectively, if we considers all banks of both types. However, when we exclude Islamic windows, the average *TDD* of non-Islamic banks is now significantly lower than those of Islamic full-fledged banks which reach an average of 70.02%. The same is hold true if we only consider privately-owned non-Islamic banks, with the average *TDD* of 65.75%. Thus, this condition together with the data for average *CAR*, imply that separating Islamic windows and Islamic full-fledged banks is important for our analyses. Therefore we consider sub-samples of Islamic banks in the empirical works as described later.

Though *TDD* is important, there are still some possibilities of early withdrawal of time deposits, which does not make it a good approximation for the probability of hold to maturity or patient households $\left(1-\rho^{i}\right)$. Moreover, *TDD* is not a banks' decision or choice that could represent their individual characteristics. Thus, based on this and referring to the previous paragraph, for the empirical exercise we directly employ individual banks' portfolio data *LAR* to calibrate parameter α^{i} in deriving the testable predictions of the next section.

2.4.2 Testable Predictions

The theoretical framework suggests four testable predictions for the responses of banks following an increase in the policy rate or the central bank lending rate. Further, in testable predictions for the comparison of non-Islamic and Islamic banks responses, we focus our comparison in accordance with the different assets portfolio composition across the two types of banks which are reflected by the different values of parameter α^{i} in the theoretical framework. Based on the summary statistics in Table 2.4.1, we set the value of

this parameter to be greater for Islamic banks in comparison to those of non-Islamic banks, i.e. $\alpha^{I} > \alpha^{NI}$. According to this set up, the following testable predictions are derived:

Prediction1. Increase in the policy rate will increase non-Islamic banks' rate of return on loans *more* than those of Islamic banks.

Prediction2. Increase in the policy rate will increase Islamic and non-Islamic banks' rate of return on deposits with *no significant difference.*

Prediction3. Increase in the policy rate will decrease non-Islamic banks' loans *more* than those of Islamic banks.

Prediction4. Increase in the policy rate will decrease (increase) non-Islamic banks' borrowing from (lending to) the central banks *more* than those of Islamic banks.

2.5 Empirical Works

2.5.1 Empirical Model

As a baseline econometric model, we apply a standard difference-in-difference strategy as in Card and Krueger (1994) on testing the testable predictions using the following difference-in-differences (DD) regression:

$$Y_{ijt} = \alpha + \beta\left(NI_{j} \times d_{t}\right) + \gamma.NI_{j} + \delta.d_{t} + X'_{ijt}\theta + \varepsilon_{ijt} \qquad (5.1)$$

where Y_{ijt} is the various variable of interest as in the testable predictions, i.e. rate of return on deposits and on loans in percentage values, the level of loans in log values, and the ratio of net-borrowing from the central bank to total assets in percentage value of bank i from group j, i.e. Islamic or non-Islamic, at time t; NI_{j} is the group dummy for non-Islamic banks; d_{t} is the treatment dummy; X_{ijt} is the matrix of banks characteristics which serve as control and explanatory variables; and ε_{ijt} is the disturbance where $\varepsilon_{ijt} = u_{i} + v_{ijt}$, with u_{i} $\sim \text{IID}\left(0, \sigma_{u}^{2}\right)$ the unobserved bank-specific effect independent of v_{ijt}, the idiosyncratic error that may have bank-specific patterns of heterokedasticity and serial correlation but

uncorrelated across banks. The treatment dummy has a value of one if the policy rate (i.e. BI-rate) is higher than a cut-off level that is considered as high, as explained in the data section and zero otherwise.[60,61]

In accordance with the theoretical framework in hand, the empirical model specifications exhibit static relationships of the policy rate to various dependent variables of interest. Though the static model has potential advantages by being more parsimonious compared with the dynamic model (Verbeek, 2012), the interest rate variables and the log of loans are trended series with autocorrelation so that using a static model would result in inefficiency on the standard errors, and even spurious regression. To deal with the inefficiency problem, we cluster the standard error in individual level as suggested by Bertrand *et al.* (2004), particularly for the difference-in-difference estimator. By clustering in this way, the standard errors are robust from a possible heteroskedasticity pattern and autocorrelation within individual. Further, to ensure that the regressions are not spurious, we must check for co-integration and find that the non-stationary variables in each particular regression are co-integrated, implying that long-run relationships exist between them (Tables A1 and A2 in Appendix 2.3).

The main parameter of interest, β, captures the DD effects of the treatment, which in this case is the higher policy rate. Any difference in the response of Islamic and non-Islamic banks is captured by this specific parameter. In particular the expected sign of the estimated parameter $\hat{\beta}$ is positive for rate of return on loans as in Prediction 1 and negative for loans and borrowing from the central bank as in Predictions 3 and 4 respectively, while for rate of return on deposits we expect $\hat{\beta}$ not to be significant as in Prediction 2. Parameter γ captures the non-Islamic banks group fixed effect, and parameter δ captures the specific time effect when the treatment is applied. The latter, or the sum of it with parameter β in the case of type NI, provides predictions for the direction of the treatment effect in the testable predictions, which are positive for both rate of return on deposits and on loans, as in

[60] See Figure 2.4.1 which shows that the policy rate is actually decreasing over time. This does not alter the results since difference-in-differences estimation assumes symmetrical response.

[61] Further, the level of policy rate itself is used in place of the treatment dummy. Thus β captures the differences on the response of non-Islamic and Islamic banks to the policy rate.

Prediction 1 and 2 respectively, and negative for loans and borrowing from the central bank, as in Prediction 3 and 4 respectively. However, this specification limits other possible common or macro factors that may affect the dependent variable. To overcome this problem, as the next step, monthly-fixed effects λ_t are used instead so that the econometric model takes the following form:

$$Y_{ijt} = \alpha + \beta\left(NI_j \times d_t\right) + \gamma.NI_j + \lambda_t + X'_{ijt}\theta + \varepsilon_{ijt} \qquad (5.2)$$

The identification of these set-ups is based on the assumption of common trend across non-Islamic and Islamic banks, so that the unobserved factors are fixed over time and across the two bank-groups. However, as Islamic banks are a relatively new industry in comparison to non-Islamic ones, they might experience higher growth in their business. In response to such a concern, we allow for each group to follow a different time trend, as in the following:

$$Y_{ijt} = \alpha + \beta\left(NI_j \times d_t\right) + \gamma_0.NI_j + \gamma_1.NI_jT + \gamma_2T + \lambda_t + X'_{ijt}\theta + \varepsilon_{ijt} \qquad (5.3)$$

where γ_0 captures non-Islamic banks group-specific intercept, as before, γ_1 and γ_2 capture the non-Islamic and Islamic banks group-specific trends respectively. Based on this specification, the identification of the response to the policy rate comes from whether such changes lead to deviations from pre-existing group-specific trends.

We also do another robustness check of the results with respect to the selected banks in the sample. That is in order to account for the effect of ownership on banks operation and performance, and also to have better understanding on how Islamic banks categories (windows or full-fledge) affect the theoretical model predictions, we cluster the samples in to three sample sets. Sample1 includes all non-Islamic and Islamic banks and is used to estimate model (5.1) – (5.3). Sample2 excludes Islamic windows and only account for full-fledged Islamic banks, and Sample3 excludes government and regional banks so that both non-Islamic and Islamic banks are privately-owned banks.[62] We apply model (5.3), the most robust specification, on Sample2 and Sample3.

[62] Sample3 is equivalent with Sample2 in Chapter 1. There, it is shown that this particular sample set provides more comparable banks across types in terms of ownership structure and assets size.

The theoretical framework from which testable predictions are derived makes assumptions about several factors. In particular, the assumption of zero net worth or equity is based on the condition that both types of bank exactly meet the maturity–match constraint (3.7), which is necessary for the banks' zero-profit equilibrium condition. Violation of the maturity-match constraint requires positive banks' equity to be held to support the zero-profit condition or, in other words, to ensure that banks stay solvent when facing liquidity shocks. The data summary in Table 2.4.1 implies that, on average, Islamic windows hold higher capital-to-assets ratio, which might signal their higher liquidity-risks exposure. The framework also excludes currency or cash holding, since inside money or deposits are the only form of money available in the economy, which is further subjected to a reserve requirement. Another excluded factor is the interbank market, for the framework assumes that banks are homogenous. The framework also absent from any default risk, in which banks are able to fully observe the outcome of investments, and from size consideration since bank size is indeterminate in equilibrium.

This set of simplifying assumptions demands that particular control variables be included in the estimation; otherwise, the regression may suffer from omitted variable bias. Thus, to overcome such possibilities, we make equity, cash holdings, interbank placements and liabilities, and total loss provisions control variables in X_{ijt} matrix.[63] In addition, to capture the effect of bank size, we include the share of individual bank assets to total assets of the industry. Other explanatory variables in that particular matrix are included based on the theoretical framework specification in the previous section.

2.5.2 Empirical Results

Before detailing the estimations of each testable prediction, we briefly look at the general pattern of the dependent variables for both types of banks, Islamic and non-Islamic. In general, the dependent variables seem to follow a trend, as shown by Figures 2.5.1 to

[63] In the form of ratio to total assets where rate of return on deposits, rate of return on loans and ratio of net-borrowing from the central bank to total assets are the dependent variables; and in log values where log of loans is the dependent variable.

2.5.4, except for net-borrowing from the central bank which is further confirmed by unit-root tests in Table A1 of Appendix 2.3, in which *Rloans*, *Rdep* and *Lloans* are only stationary in level if we include linear time trends.

The average rate of return on loans of the two types of banks in Figure 2.5.1 shows that they seem to follow different trends, especially in the first half of the sample. In particular, the average rate of return on loans of all and privately-owned non-Islamic banks was decreasing since January 2009, while the one of Islamic banks, especially Islamic full-fledged banks, was still increasing up to around the end of 2010 after which it started to have the same decreasing trend as non-Islamic banks. It is apparent that Islamic banks' rate of return on loans vary not as smooth as the rate of return of their non-Islamic counterparts, which is probably caused by the application of the profit and loss sharing contract in the Islamic banking financing service, in which the effective rate of return on loans is based on the predetermined sharing coefficient instead of a predetermined nominal return.

In Figure 2.5.2 we can see that the weighted rate of return on deposits of non-Islamic and Islamic banks follow approximately the same pattern throughout the sample. Similar with the rate of return on loans, Islamic banks' weighted rate of return on deposits vary less smoothly than those of non-Islamic banks. This condition may also results from the profit and loss sharing scheme that is mainly adopted by the Islamic banks.[64]

The patterns of average *Lloans* in Figure 2.5.3 are more apparent in following a long-term linear trend. As Islamic banks in Indonesia remain in their expansion phase, their business growth is expected to be faster than pre-existing non-Islamic banks. The pattern shows that when we consider sample with all Islamic banks, the linear trend seems steeper than non-Islamic banks but not when we only consider Islamic full-fledged banks. The empirical exercise would further investigate whether the effect of the policy rate is significant enough in governing the series of different long-term trends.

[64] Nevertheless, Islamic banks may not perfectly adopt profit and loss sharing mechanism in paying their depositors (investment account holders) due to competitive issues (see Chapter 1 on banks profit stability).

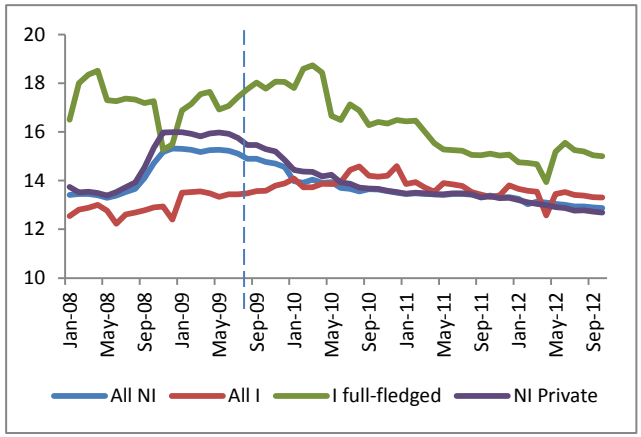

Figure 2.5.1 Group-average rate of return on loans (*Rloans* in %)

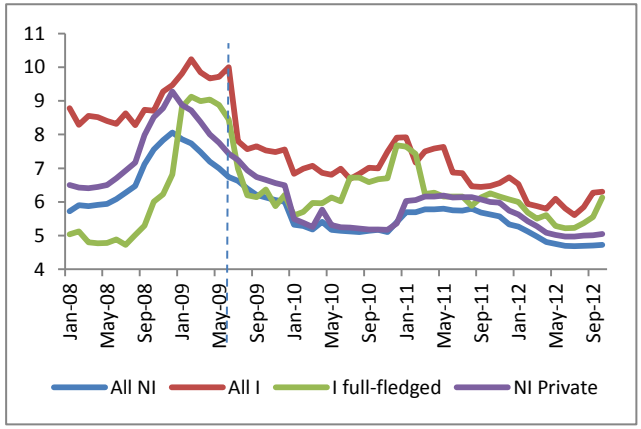

Figure 2.5.2 Group-average weighted rate of return on deposits (*Rdep* in %)

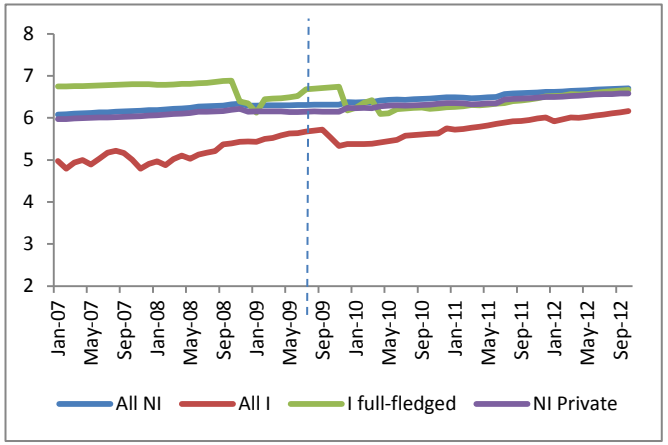

Figure 2.5.3 Log of total loans (*Lloans*)

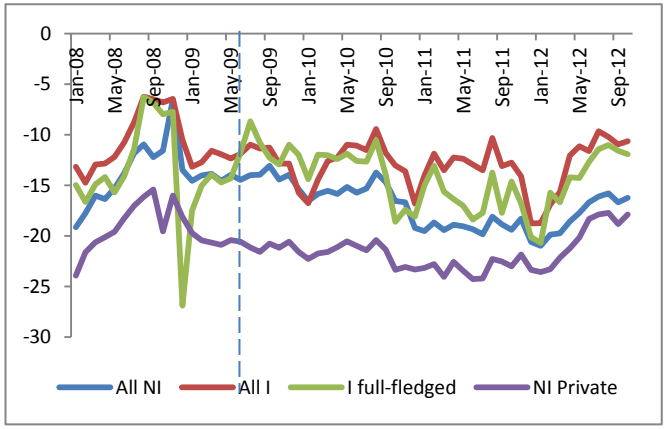

Figure 2.5.4 Group-average net-borrowing from the central bank (*NCB* in %)

As explained in section 2.2.1, most of banks have a positive balance in the central bank, in addition to the required reserve, which is entitled to a certain return tied to the policy rate. Figure 2.5.4 shows that on average, non-Islamic banks have more placements (fewer liabilities) in the central bank as a percentage value of their total assets in comparison to their Islamic counterparts. These values seem to exhibit more seasonality factor than a long-term trend. Thus, inclusion of group-specific trends is not expected to deliver significantly different results.

2.5.2.1 Estimation of rate of return on loans

Based on the theoretical framework, factors that determine the rate of return on loans are the policy rate, the reserve ratio and the loan-to-asset ratio. These factors are included in the estimation as explanatory variables. However, since the reserve ratio is relatively constant during period of observations, it is not included in the estimation, but the ratio of net-borrowing from the central bank to total assets, *NCB*, is included instead. In addition, several control variables are included to capture factors that are not considered in the theoretical framework. These additional control variables are equity, cash holding, net-interbank position and total loss provisions, where all are in the form of ratios to total assets. Table 2.5.1(a) provides estimation results using the baseline model (5.1), model with time dummies as in (5.2), and model with time dummies and group-specific time trends as in (5.3) on Sample1. Table 2.5.1(b) provides estimation results of model (5.3) on Sample2 and Sample3. The rest of the empirical results of other variables follow the same format except for *NCB*.

Columns (1) and (3) of Table 2.5.1(a) show that estimations of the baseline model, in Sample1 support Prediction1. In response to policy rate that is higher than 6.5%, non-Islamic banks increase their rate of return on loans 123 bps higher than Islamic banks do, as shown in the first row of column (1). From estimation with the level of policy rate as the treatment in column (2), non-Islamic bank raise their rate of return on loans 79.6 bps higher

than Islamic banks in response to 100 bps increases in the policy rate. Adding time dummies does not change the significance of these differences. These results fall partly in line with those of Hutapea and Kasri (2010), though with a different point of analysis, who finds that in the period of increasing market interest rate, Islamic banks could not adjust their lending rates as much as non-Islamic banks.[65] Nevertheless, unlike what the framework predicts in (3.22), the interest pass-through is not complete in general.

Further, specification (5.3) is estimated by allowing the two groups to follow different time trends. In this case, the identification of the effect of the policy rate comes from whether such policy changes lead to deviations from pre-existing group-specific trends. Estimation results for Sample1 in columns (5) to (8) of Table 2.5.1(a) show that once these group-specific trends are introduced, the significant differences disappear. However, unlike the results on Sample1, when we estimate the same specification on Sample2 and Sample3 (both exclude Islamic windows) , the significant differences between responses of *Rloans* to policy rate in non-Islamic and Islamic banks are still apparent and supporting Prediction 1 (Table 2.5.2 (b), first and second rows). These imply that Islamic windows considerably suppress the potential differences between non-Islamic and Islamic banks in Sample1. Possibly, their interdependent with the corresponding non-Islamic bank as their main office might weaken the theoretical potential differences by violating the complete separation assumption in the theoretical framework (Section 2.3).

The pass-through of the policy rate on *Rloans* seems fairly negligible. For Sample1 the estimated coefficient of the policy rate, *Rhigh* or *R*, in columns (5) and (6) of Table 2.5.1(a) is insignificant. For Sample2 and Sample3, 100 bps increases in policy rate only account to 5.8 bps and 7.2 bps increase in non-Islamic banks' *Rloans*, respectively. This finding and the considerably high excess liquidity of the banking industry are in line with Gigineishvili (2011), who considers cases in 70 countries, and suggests that excess banking liquidity impedes the interest rate pass-through on the retail lending rate. In addition, as shown by the estimation results of loans in the next sub-section, the demand for loans are

[65] According to their study, once the selling price is agreed upon, according to *Sharia* rule Islamic banks' lending rate could not be upwardly adjusted.

relatively inelastic, indicating the low degree of competition in the banking industry. The literature of interest rate pass-through generally confirms that competition strengthens the pass-through process (among others Cottarelli and Kourelis (1994), Sorensen and Werner (2006), Gigineishvili (2011) and Trinugroho et.al (2014) for the case of Indonesia). Our finding of weak pass-through and inelastic loans are in support of this line of literature. On the other hand, the pass-through on Islamic banks is unexpectedly negative at 10% level of significance where 100 bps increases in policy rate is associated with 116 bps and 105 bps decreases on Islamic banks' *Rloans* in Sample2 and Sample3, respectively (Table 2.5.2(b) columns (2) and (6)). This somewhat may have been driven by the profit and loss sharing contract in the Islamic banking financing service, in which the effective rate of return on loans is based on the predetermined sharing coefficient instead of a predetermined nominal return so that its correlations with policy rate is less straight forward. Nevertheless, further research is needed to explain this finding.

For the effects of control variables, *LAR* and *NCB* as two variables from the theoretical framework, turns out to be insignificantly affects banks' loans rate in all sample sets. For the control variables that are not included in the theoretical framework, the estimations show varying results across sample sets. In Sample1, banks with higher capital *CAR* tend to have lower loans rates at 10% level of significance, but insignificant in Sample2 and Sample3. In this case, it seems that the conventional risk-return hypothesis may have applied to banks with a lower capital ratio, hence more risk delivers higher returns in comparison to a better-capitalized bank. Nevertheless, the estimated effect is negligible, as 1 percentage of higher *CAR* is associated with only around 0.6 bps lower loans rate (Table 2.5.1(a), fourth row). All results for Sample1 and some results for Sample3 show that banks which hold more cash, *KAR*, tend to have a higher loans rate in order to compensate for the foregone return of holding cash, but not for Sample2. On the other hand, the estimated coefficients of *NIB* in Sample2 and Sample3 are significantly positive, but not in Sample1. For the Market-share variable, as a representation of size and market power, the results show that it does not significantly correlate with the rate of return on loans in all sample sets.

Table 2.5.1(a) Estimation results of rate of return on loans (*Rloans*) for Sample1

	Sample1							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Rhigh X Dummy NI	1.231***	-	0.966***	-	0.240	-	0.269	-
	(0.381)		(0.365)		(0.276)		(0.293)	
R X Dummy NI	-	0.796***	-	0.696**	-	0.257	-	0.343
		(0.291)		(0.319)		(0.196)		(0.219)
LAR	-0.004	-0.003	-0.001	-0.002	-0.003	-0.003	-0.002	-0.002
	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)
CAR	-0.005*	-0.006*	-0.006*	-0.006*	-0.006*	-0.006*	-0.006*	-0.006*
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
KAR	0.183**	0.167**	0.138*	0.137*	0.132*	0.133*	0.129*	0.132*
	(0.080)	(0.076)	(0.077)	(0.075)	(0.072)	(0.072)	(0.073)	(0.073)
NIB	0.019	0.020	0.022	0.022	0.018	0.019	0.021	0.021
	(0.017)	(0.017)	(0.017)	(0.017)	(0.017)	(0.017)	(0.017)	(0.017)
LLP	0.050*	0.045*	0.029	0.025	0.035*	0.035*	0.022	0.022
	(0.026)	(0.024)	(0.025)	(0.023)	(0.021)	(0.021)	(0.022)	(0.022)
NCB	0.008	0.007	0.003	0.004	0.008	0.008	0.005	0.005
	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.008)	(0.008)	(0.008)
Market Share	0.456	0.454	0.459	0.439	0.439	0.440	0.424	0.426
	(0.360)	(0.366)	(0.378)	(0.374)	(0.355)	(0.355)	(0.367)	(0.369)
Rhigh or R[a)]	-0.586*	-0.347	-	-	-0.245	-0.237	-	-
	(0.347)	(0.276)			(0.256)	(0.175)		
Time effects	No	No	Yes	Yes	No	No	Yes	Yes
Group time trends	No	No	No	No	Yes	Yes	Yes	Yes
Observations	8,354	8,354	8,354	8,354	8,354	8,354	8,354	8,354
R-squared	0.043	0.066	0.126	0.135	0.082	0.082	0.137	0.138

Notes: Within group estimation. Clustered standard errors in parentheses. Coefficient that are significantly different from zero at the 1%, 5% and 10% level are marked with ***, **, and * respectively. All estimations include a constant term and NI dummy. Rhigh is a dummy variable for policy rate > 6.5% and R is the level of policy rate. LAR, CAR, KAR, NIB, LLP and NCB are ratio of loans, equity, cash, net-interbank placements, loss provisions and net-borrowing to the central bank to total assets, respectively. Market Share is share of individual assets to total assets of industry. a) Rhigh for columns (1) and (5), R for columns (2) and (6).

Table 2.5.1(b) Estimation results of rate of return on loans (*Rloans*) for Sample2 and Sample3

	Sample2				Sample3			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Rhigh X Dummy NI	0.916*	-	0.915*	-	0.830	-	0.809	-
	(0.498)		(0.492)		(0.511)		(0.501)	
R X Dummy NI	-	1.217*	-	1.252**	-	1.124*	-	1.104*
		(0.626)		(0.621)		(0.591)		(0.586)
LAR	-0.005	-0.006	0.008	0.007	-0.003	-0.005	0.014	0.013
	(0.021)	(0.021)	(0.023)	(0.023)	(0.023)	(0.023)	(0.025)	(0.025)
CAR	-0.001	-0.001	-0.001	-0.001	-0.000	-0.001	-0.001	-0.001
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
KAR	0.142	0.144	0.095	0.094	0.544*	0.537*	0.486	0.479
	(0.130)	(0.128)	(0.129)	(0.128)	(0.308)	(0.303)	(0.306)	(0.300)
NIB	0.047**	0.047**	0.052**	0.052**	0.049*	0.049*	0.051*	0.051*
	(0.023)	(0.023)	(0.023)	(0.023)	(0.028)	(0.028)	(0.027)	(0.027)
LLP	0.040*	0.041*	0.017	0.017	0.039*	0.039*	0.010	0.010
	(0.023)	(0.023)	(0.019)	(0.018)	(0.022)	(0.022)	(0.018)	(0.018)
NCB	0.002	0.002	-0.013	-0.012	0.006	0.006	-0.009	-0.009
	(0.018)	(0.018)	(0.019)	(0.019)	(0.023)	(0.024)	(0.024)	(0.024)
Market Share	0.436	0.432	0.441	0.435	1.541	1.530	1.615	1.600
	(0.368)	(0.369)	(0.384)	(0.384)	(1.177)	(1.171)	(1.198)	(1.197)
Rhigh or R[a)]	-0.885*	-1.159*	-	-	-0.767	-1.052*	-	-
	(0.481)	(0.623)			(0.477)	(0.581)		
Time effects	No	No	Yes	Yes	No	No	Yes	Yes
Group time trends	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	6,943	6,943	6,943	6,943	5,132	5,132	5,132	5,132
R-squared	0.119	0.121	0.196	0.199	0.139	0.141	0.241	0.243

Notes: Within group estimation. Clustered standard errors in parentheses. Coefficient that are significantly different from zero at the 1%, 5% and 10% level are marked with ***, **, and * respectively. All estimations include a constant term and NI dummy. Rhigh is a dummy variable for policy rate > 6.5% and R is the level of policy rate. LAR, CAR, KAR, NIB, LLP and NCB are ratio of loans, equity, cash, net-interbank placements, loss provisions and net-borrowing to the central bank to total assets, respectively. Market Share is share of individual assets to total assets of industry. Sample2 excludes Islamic-windows; Sample3 is Sample2 excluding government and regional banks.
a) Rhigh for columns (1) and (5), R for columns (2) and (6).

2.5.2.2 Estimation of rate of return on deposits

In section 2.3.3, the weighted average rate of return on deposits is determined by the returns that banks received from their different assets portfolio. These various returns are, in turn, satisfying the non-arbitrage condition that ensures an optimum borrowing from the central bank. According to this, the assets portfolio and its respective returns do affect the return that banks give on deposits but do not affect its response to changes in the central bank rate. Thus, the rate of return on loans and loan-to-asset ratio are included as explanatory variables, while the same with the previous estimation of rate of return on loans, *NCB* is included in place of the reserve requirement ratio, with ratio of equity, cash holdings, net-interbank position and loss provisions to total assets being included as control variables.

Columns (1) and (2) in Table 2.5.2(a) show that Prediction 2 is empirically supported by the data in Sample1. The weighted returns on deposits, *Rdep*, of the two bank-groups vary positively with the policy rate, as shown in the treatment effect, where a policy rate higher than 6.5% on average is followed by 203 bps increase in the deposit rate (column (1)), or for every 100 bps of policy rate, banks' retail deposit rate in increases by 120 bps (column (2)), indicating a complete interest rate pass through. As further confirmation of Prediction 2, there are no significant differences in their responses, as shown by the insignificant estimated coefficients on the first and second rows. Results in columns (3) and (4) with the time dummies confirm the baseline results. Similar results were also garnered by Hutapea and Kasri (2010) for the Indonesian case, and Cevik and Charap (2011) for the cases of Malaysia and Turkey.

Columns (5) to (8) in Table 2.5.2(a) show that, as already apparent from Figure 2.4.2, inclusions of group-specific trends do not alter the no-difference results shown in the first two rows. These results are quite robust to different sub samples as in Table 2.5.2(b), except for column (8) in Sample3 where privately-owned non-Islamic banks increase their deposit rate more than their Islamic counterparts. However, these group-specific time trends do significantly cut the estimated pass-through, as shown by Table 2.5.2(a) from 120 % (column (2)) to around 60% (column (8)), implying that the previous estimation is driven by

the group specific time-trend, lessening the pass-through. For the sub-samples in Table 2.5.2(b), the pass-through is even lower at 47.3% for Sample2 (column (2)) and at 41.4% for Sample3 (column (6)). This finding of incomplete pass-through on deposits rate is predicted by the framework as in (3.24). It is also in parallel with studies in the literature such as Bondt (2002) for the Euro area and Wang and Lee (2009) for Asia, in which Indonesia took part, who find respectively 40% and 45% long-run pass-through.

The loan-to-asset ratio, *LAR*, and the rate of return on loans, *Rloans*, positively affect the weighted rate of return on deposits as predicted by the theoretical framework. An extra 1 percentage increases in share of loans to total assets is associated with an extra 15-16 bps on deposits rate in Sample1 (Table 2.5.2(a) column (5)-(8)), but the effect is not significant in Sample2 and Sample3 (Table 2.5.2(b)). While for *Rloans*, its significant positive effect on *Rdep* is robust to all sample sets at 1% level of significance. The baseline results in Sample1 show that net-borrowing from the central bank, *NCB*, has a significantly positive correlation with *Rdep*, implying that banks actually share the gain from this net-borrowing activity with their depositors (Table 2.5.2(a) columns (1) and (3)). These results are even stronger and considerably more significant for Sample2 and Sample3 in Table 2.5.2(b).

For the control variables from outside the theoretical framework, higher cash holdings are correlated with lower rate of return on deposits, in which an additional 1% of *KAR* corresponds to about 22 bps decreases in the deposits rate in Sample1 and Sample3, and around 14 bps decreases in Sample2. These results indicate that holding cash conveys a lower rate of return than other asset portfolios. The more a bank holds its assets in cash, the smaller the return to be paid to the depositor. Similar with estimation on rate of return on loans, the Market share variable also does not significantly affect the rate of return on deposits for all samples. However, the ratio of loss provisions to total assets, *LLP*, which reflects assets quality or default risks, is negatively significant in affecting deposits rate. Lower assets quality induces lower banks return and thus the return to be paid to the depositor. This effect is significant at 10% level in Sample1 (Table 2.5.2(a) columns (3), (4), (7) and (8), but not significant in Sample2 and Sample3, which may imply that the results

are mainly driven by the Islamic windows that are excluded from the other two sample sets. In the contrary, the estimated coefficients of *CAR* and *NIB*, which are insignificant in Sample1, are negatively significant in Sample2 and Sample3. Again, these show that the effect of control variables are varying across sample sets.

Overall, the estimation results of rate of return on deposits are in support of Prediction2 for all sample sets, with a stronger interest rate pass-through in comparison to the one via rate of return on loans. As predicted by the theoretical framework, in general there is no significant difference in pass-through via non-Islamic and Islamic banks since transmissions on both types of banks are merely subject to satisfaction of the non-arbitrage condition.

Table 2.5.2(a) Estimation results of weighted rate of return on deposits (*Rdep*) for Sample1

	Sample1							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Rhigh X Dummy NI	-0.973	-	-0.757	-	-0.099	-	-0.127	-
	(0.906)		(0.842)		(0.364)		(0.362)	
R X Dummy NI	-	-0.617	-	-0.492	-	-0.035	-	0.048
		(0.534)		(0.533)		(0.291)		(0.279)
LAR	0.011*	0.013*	0.015**	0.015**	0.015**	0.015**	0.016**	0.016**
	(0.006)	(0.007)	(0.007)	(0.007)	(0.007)	(0.008)	(0.008)	(0.007)
CAR	-0.003*	-0.003	-0.003	-0.003	-0.002	-0.002	-0.003	-0.003
	(0.002)	(0.002)	(0.002)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
KAR	-0.151***	-0.204***	-0.228***	-0.227***	-0.218***	-0.218***	-0.221***	-0.220***
	(0.044)	(0.051)	(0.058)	(0.057)	(0.056)	(0.056)	(0.053)	(0.053)
NIB	-0.004	-0.002	0.000	0.001	-0.003	-0.002	0.001	0.001
	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.007)	(0.007)	(0.007)
LLP	-0.017	-0.016	-0.031*	-0.029*	-0.018	-0.014	-0.025*	-0.024*
	(0.019)	(0.017)	(0.018)	(0.017)	(0.015)	(0.014)	(0.014)	(0.014)
NCB	0.014***	0.009	0.010*	0.009	0.010	0.008	0.008	0.008
	(0.005)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.007)	(0.007)
Rloans	0.195***	0.181***	0.128***	0.134***	0.182***	0.182***	0.138***	0.138***
	(0.036)	(0.029)	(0.025)	(0.027)	(0.029)	(0.028)	(0.027)	(0.027)
Market Share	-0.011	0.060	0.067	0.077	0.074	0.083	0.094	0.095
	(0.139)	(0.132)	(0.132)	(0.139)	(0.139)	(0.143)	(0.151)	(0.151)
Rhigh or R[a)]	2.035**	1.201**	-	-	0.801**	0.593**	-	-
	(0.898)	(0.532)			(0.351)	(0.286)		
Time effects	No	No	Yes	Yes	No	No	Yes	Yes
Group time trends	No	No	No	No	Yes	Yes	Yes	Yes
Observations	8,260	8,260	8,260	8,260	8,260	8,260	8,260	8,260
R-squared	0.152	0.192	0.232	0.235	0.195	0.199	0.240	0.240

Notes: Within group estimation. Clustered standard errors in parentheses. Coefficient that are significantly different from zero at the 1%, 5% and 10% level are marked with ***, **, and * respectively. All estimations include a constant term and NI dummy. Rhigh is a dummy variable for policy rate > 6.5% and R is the level of policy rate. LAR, CAR, KAR, NIB, LLP and NCB are ratio of loans, equity, cash, net-interbank placements, loss provisions and net-borrowing to the central bank to total assets, respectively. Market Share is share of individual assets to total assets of industry. Sample1 consists of all banks. a) Rhigh for columns (1) and (5), R for columns (2) and (6).

Table 2.5.2(b) Estimation results of weighted rate of return on deposits (*Rdep*) for Sample2 and Sample3

	Sample2				Sample3			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Rhigh X Dummy NI	0.155	-	0.129	-	0.467	-	0.401	-
	(0.308)		(0.314)		(0.297)		(0.317)	
R X Dummy NI	-	0.076	-	0.229	-	0.390	-	0.554***
		(0.261)		(0.213)		(0.241)		(0.192)
LAR	-0.017	-0.013	-0.010	-0.010	-0.021	-0.018	-0.012	-0.013
	(0.011)	(0.012)	(0.011)	(0.011)	(0.013)	(0.013)	(0.013)	(0.013)
CAR	-0.002**	-0.003**	-0.003***	-0.003**	-0.002*	-0.003**	-0.003**	-0.003**
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
KAR	-0.104*	-0.106*	-0.143**	-0.143**	-0.163*	-0.224**	-0.222**	-0.225**
	(0.054)	(0.055)	(0.063)	(0.063)	(0.091)	(0.090)	(0.094)	(0.093)
NIB	-0.024***	-0.021**	-0.016**	-0.016**	-0.027***	-0.024**	-0.019*	-0.019*
	(0.008)	(0.008)	(0.008)	(0.008)	(0.010)	(0.010)	(0.010)	(0.010)
LLP	0.002	0.004	-0.008	-0.008	0.002	0.006	-0.006	-0.006
	(0.005)	(0.005)	(0.005)	(0.005)	(0.006)	(0.006)	(0.006)	(0.006)
NCB	0.036***	0.030***	0.028***	0.028***	0.036***	0.026**	0.025**	0.025**
	(0.009)	(0.009)	(0.009)	(0.009)	(0.011)	(0.011)	(0.012)	(0.012)
Rloans	0.193***	0.192***	0.136***	0.135***	0.184***	0.184***	0.110***	0.109***
	(0.027)	(0.026)	(0.022)	(0.022)	(0.025)	(0.024)	(0.021)	(0.022)
Market Share	-0.031	-0.013	-0.001	-0.002	-0.061	0.026	0.092	0.086
	(0.112)	(0.117)	(0.119)	(0.119)	(0.332)	(0.308)	(0.322)	(0.319)
Rhigh or R[a)]	0.571*	0.473*	-	-	0.533*	0.414*	-	-
	(0.304)	(0.254)			(0.297)	(0.234)		
Time effects	No	No	Yes	Yes	No	No	Yes	Yes
Group time trends	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	6,880	6,880	6,880	6,880	5,072	5,072	5,072	5,072
R-squared	0.318	0.326	0.416	0.416	0.409	0.430	0.554	0.555

Notes: Within group estimation. Clustered standard errors in parentheses. Coefficient that are significantly different from zero at the 1%, 5% and 10% level are marked with ***, **, and * respectively. All estimations include a constant term and NI dummy. Rhigh is a dummy variable for policy rate > 6.5% and R is the level of policy rate. LAR, CAR, KAR, NIB, LLP NCB are ratio of loans, equity, cash, net-interbank, loss provisions and net-borrowing to the central bank to total assets, respectively. Market Share is share of individual assets to total assets of industry. Sample2 excludes Islamic-windows; Sample3 is Sample2 excluding government banks. a) Rhigh for col.(1)&(5), R for col.(2)&(6).

2.5.2.3 Estimation of total loans

In the theoretical framework, the main explanatory variable for loans is the rate of return on loans, *Rloans*, which might have a positive effect for the supply of loans, or negative effect for demand for loans. The other explanatory variable from the framework is the net-borrowing from the central bank, *NCB*, which is expected to positively affect business loans via the supply side. The banks equity and other banks assets that are not included in the theoretical framework serve as additional control variables in the estimation. All variables are in log values, except for *NCB* and *Rloans* which are in percentage value.

The baseline estimation results in columns (1) to (4) of Table 2.5.3(a) show that Prediction3 is partially supported by the data in Sample1. In particular, the empirical test confirms that banks loans are decreasing following the treatment. However in contrary to the framework prediction, the decreases are larger for Islamic banks. In column (1) following policy rate higher than 6.5%, total loans of non-Islamic and Islamic banks are decreasing by approximately 7.3% and 24.1%, respectively. A similar result in column (2), which shows that an increase in 100 bps in the policy rate corresponds to a decrease of 10% and 25% on loans of non-Islamic and Islamic banks, respectively. Arguably, the higher growth trend of Islamic banks when compared to non-Islamic banks may have contributed to these contrary results. Thus, the inclusion of group-specific time trends is even more crucial for this highly trended series.

Columns (5) to (8) show that, the significant differences disappear once the group-specific time trends are introduced, suggesting that non-Islamic banks and Islamic banks loans do not, in fact, respond differently to the policy rate. These results are generally supported by the results for Sample2 and Sample3 as in Table 2.5.3(b), except for the baseline estimation using *Rhigh* as the treatment, though it disappear in more robust estimations. Apparently, the significant differences from the previous results are driven by the pre-existing long-term trend of the series.

The additional net-borrowing from the central banks is significantly increasing the supply of loans. However, the rate of return on loans does not significantly affect the volume

of loans in all sample sets, suggesting inelastic loan demand and supply functions. This insignificant effect partly explains why the significant differences in response of *Rloans*, as in Table 2.5.1(b) for Sample2 and Sample3, do not feed on to differences in response of loans in the same sample sets. This finding is in accordance with Trinugroho et.al (2014) who studies Indonesian banks' continuously high net interest margin since the financial crisis in 1997/1998. Further, this high net interest margin could be a sign that banks are facing a relatively inelastic demand for loans (Ho and Saunders, 1981).

Log of equity, cash holding and interbank liabilities are positively correlated with log of loans, indicating that these control variables positively contribute to the evolution of supply of loans with a negative contribution from interbank placements, as expected. For Sample1, the highest effect comes from cash holding, of which 10% increases in cash holding are associated with up to around 30% increases in loans (Table 2.5.3(a), columns (5) – (8)), and the effect is slightly lower for Sample2 and Sample3. This indicates banks' inclination to hold more liquid assets to anticipate their illiquid investment. On the other hand, unlike the previous results where market share does not significantly affect a bank's rate of return on loans, it does play a significant role in explaining banks loans in all sample sets. For Sample1 and Sample2 a 1% increase in a bank's market share of each type is associated with around 10-11% increases in loans, and the effect is even higher for Sample3 which reaches around 30%. These significant results could be a sign of bank lending channel operating, where larger banks tend to face less hindrance for non-deposit funding to support their lending activities (Kashyap and Stein, 1995).[66] It also could be an indication of higher loans diversifications that bolster loan growth of larger banks in comparison to smaller banks (Smirlock, 1985). Nevertheless, the inclusion of group-specific time trends generally removes the significant effect of the policy rate in all sample sets. Apparently, loans growth of non-Islamic and Islamic banks already exhibit long term trends despite of the evolution of the policy rate.

[66] Though in this case we expect policy rate to significantly affect bank lending, which is not the case as we will see further after the inclusion of group-specific time trends.

Table 2.5.3(a) Estimation results of total loans (in log values) for Sample1

	Sample1							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Rhigh X Dummy NI	0.168**	-	0.182**	-	0.022	-	0.021	-
	(0.078)		(0.073)		(0.072)		(0.073)	
R X Dummy NI	-	0.152***	-	0.142***	-	0.022	-	0.022
		(0.044)		(0.046)		(0.051)		(0.055)
Lequity	0.191***	0.171***	0.131***	0.130***	0.130***	0.130***	0.127***	0.127***
	(0.064)	(0.057)	(0.047)	(0.046)	(0.045)	(0.045)	(0.045)	(0.045)
Lcash	0.489***	0.412***	0.336***	0.319***	0.294***	0.291***	0.305***	0.305***
	(0.096)	(0.092)	(0.084)	(0.084)	(0.082)	(0.082)	(0.084)	(0.084)
Lintbanka	-0.024	-0.038**	-0.050***	-0.052***	-0.053***	-0.053***	-0.052***	-0.052***
	(0.016)	(0.016)	(0.017)	(0.017)	(0.017)	(0.017)	(0.017)	(0.017)
Lintbankp	0.059***	0.050***	0.043***	0.042***	0.041***	0.041***	0.041***	0.041***
	(0.010)	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)
Lsecurities	0.008	0.009	0.012	0.012	0.012	0.012	0.011	0.011
	(0.010)	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)
NCB	0.015***	0.017***	0.017***	0.017***	0.018***	0.017***	0.018***	0.018***
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
Rloans	-0.016	-0.010	0.004	0.003	0.002	0.002	0.003	0.003
	(0.011)	(0.011)	(0.011)	(0.011)	(0.011)	(0.011)	(0.011)	(0.011)
Market Share	0.113*	0.114*	0.125*	0.125*	0.124*	0.124*	0.124*	0.124*
	(0.066)	(0.061)	(0.065)	(0.068)	(0.065)	(0.067)	(0.067)	(0.067)
Rhigh or R[a)]	-0.241***	-0.250***	-	-	0.061	0.031	-	-
	(0.078)	(0.047)			(0.068)	(0.048)		
Time effects	No	No	Yes	Yes	No	No	Yes	Yes
Group time trends	No	No	No	No	Yes	Yes	Yes	Yes
Observations	8,264	8,264	8,264	8,264	8,264	8,264	8,264	8,264
R-squared	0.526	0.558	0.618	0.622	0.617	0.617	0.625	0.625

Notes: Within group estimation. Clustered standard error in parentheses. Coefficient that are significantly different from zero at the 1%, 5% and 10% level are marked with ***, **, and * respectively. All estimations include a constant. Market Share is share of individual assets to total assets of industry. Variable x in log values written as Lx, and NCB is ratio of net-borrowing to the central bank to total assets. Sample1 consists of all banks. a) Rhigh for columns (1) and (5), R for columns (2) and (6).

Table 2.5.3(b) Estimation results of total loans (in log values) for Sample2 and Sample3

	Sample2				Sample3			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Rhigh X Dummy NI	0.126*	-	0.100	-	0.116*	-	0.092	-
	(0.066)		(0.068)		(0.066)		(0.069)	
R X Dummy NI	-	0.133	-	0.140	-	0.110	-	0.124
		(0.106)		(0.113)		(0.094)		(0.104)
Lequity	0.317***	0.319***	0.307***	0.306***	0.328***	0.328***	0.313***	0.312***
	(0.063)	(0.064)	(0.064)	(0.064)	(0.064)	(0.064)	(0.065)	(0.065)
Lcash	0.257**	0.254**	0.273**	0.272**	0.239**	0.236**	0.257**	0.256**
	(0.106)	(0.106)	(0.109)	(0.109)	(0.111)	(0.111)	(0.116)	(0.115)
Lintbanka	-0.040***	-0.040***	-0.040***	-0.040***	-0.045**	-0.045**	-0.042**	-0.042**
	(0.015)	(0.015)	(0.015)	(0.015)	(0.020)	(0.020)	(0.019)	(0.019)
Lintbankp	0.040***	0.040***	0.041***	0.041***	0.049***	0.049***	0.049***	0.049***
	(0.012)	(0.012)	(0.012)	(0.012)	(0.014)	(0.014)	(0.014)	(0.014)
Lsecurities	0.009	0.010	0.010	0.010	0.012	0.012	0.012	0.012
	(0.008)	(0.008)	(0.009)	(0.009)	(0.010)	(0.010)	(0.010)	(0.010)
NCB	0.018***	0.018***	0.018***	0.018***	0.024***	0.024***	0.024***	0.024***
	(0.004)	(0.004)	(0.004)	(0.004)	(0.005)	(0.005)	(0.006)	(0.006)
Rloans	-0.000	-0.001	0.004	0.004	-0.000	-0.001	0.005	0.005
	(0.013)	(0.013)	(0.013)	(0.013)	(0.013)	(0.013)	(0.013)	(0.014)
Market Share	0.110*	0.110*	0.110*	0.110*	0.321**	0.327**	0.316**	0.316**
	(0.056)	(0.058)	(0.058)	(0.058)	(0.147)	(0.148)	(0.141)	(0.141)
Rhigh or R[a)]	-0.047	-0.082	-	-	-0.040	-0.072	-	-
	(0.060)	(0.104)			(0.057)	(0.091)		
Time effects	No	No	Yes	Yes	No	No	Yes	Yes
Group time trends	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	6,917	6,917	6,917	6,917	5,106	5,106	5,106	5,106
R-squared	0.590	0.590	0.606	0.607	0.589	0.588	0.607	0.607

Notes: Within group estimation. Clustered standard error in parentheses. Coefficient that are significantly different from zero at the 1%, 5% and 10% level are marked with ***, **, and * respectively. All estimations include a constant. Market Share is share of individual assets to total assets of industry. Variable x in log values written as Lx, and NCB is ratio of net-borrowing to the central bank to total assets. Sample2 excludes Islamic-windows; Sample3 is Sample2 excluding government banks. a) Rhigh for col.(1)&(5), R for col.(2)&(6).

2.5.2.4 Estimation of net-borrowing from the central bank

Given the demand for business loans at the prevailing level of deposits, banks adjust their balances in the central bank to meet their demand for reserves taking into account the required reserves ratio. Since net-worth is assumed to be zero in the theoretical framework, *NCB* is taken as the amount of net-borrowed reserves to total assets instead of to total deposits. Thus, the explanatory variable that is used in the estimation on *NCB* is the loan-to-asset ratio, *LAR*, in which the higher the ratio, the higher is the borrowed reserves. To ensure consistency, the control variables used in the estimation, i.e. equity, cash holding and net-interbank placement, are also in percentage values of total assets.[67] Table 2.5.4(a) provides estimation results using the baseline model (5.1), model with time dummies as in (5.2), and model with time dummies and group-specific time trends as in (5.3) on Sample1. Since the unit-root test shows that *NCB* does not exhibit a linear trend, Table 2.5.4(b) provides estimation results of model (5.1) and (5.2) on Sample2 and Sample3, without group-specific time trends.

Table 2.5.4(a) shows that there is no significant response of the two bank-groups' net-borrowing from the central bank to the policy rate across observations in Sample1. As expected, inclusion of group-specific trends does not change the results. However, the results of Sample2 and Sample3 does show that non-Islamic banks cut their borrowing or increase their placements in the central bank following increases in the policy rate, while there is no significant response from Islamic banks. This implies that Islamic windows' responses are similar with non-Islamic banks, so that the differences become apparent when they are excluded from the sample. Table 2.5.4(b) columns (4) and (8) show non-Islamic banks' *NCB* decrease by 2.9% and by 2.2% for every 100 bps increases in the policy rate in Sample2 and Sample3, respectively. Since previous results show that non-Islamic banks do not significantly decrease their loans in response to policy rate increase, the significant decreases on their *NCB* indicate that there may be changes on the other banks' assets portfolio beside loans to accommodate these decreases.

[67] In addition, ratio of securities to total assets is also used as additional control variable.

The explanatory variable, *LAR*, is positively significant in affecting *NCB*, as expected by the theoretical framework. The estimated coefficient on *LAR* in Sample1 is smaller than in Sample2 and Sample3, but still considerably high where 100 bps increases in *LAR* is associated by around 57 bps increases in *NCB* for Sample1, and around 76 bps and 67 bps for Sample2 and Sample3, respectively. The other assets portfolio that is not included in the theoretical framework also show significant positive effect on *NCB* which indicates that other liquid assets partially substitute banks' placement at the central bank. This partial substitution implies the risk-adjusted return of placement at the central bank is higher than any other liquid assets. The ratio of loans loss provisions, *LLP*, which reflects default risks, significantly affects *NCB* in which a 100 bps increases in the particular ratio induces around a 44 bps decreases in *NCB* in Sample1, while Sample2 and Sample3 show similar responses. However, while *Rdep* is insignificant in Sample2, it is positively significant in correlating with *NCB* in Sample2 and Sample3 at 1% level of significance. One of the possible explanations is that, as one of the alternatives for source of funds besides deposits, borrowing from the central bank increase when cost from deposit is higher. The rest of the independent variables, i.e. banks capital, market share, and banks prices on loans, appear to be insignificant.

To sum up, the estimation results of return on *NCB* are somewhat in support of Prediction 4 for sub-samples that exclude Islamic windows. As predicted by the theoretical framework, non-Islamic banks *NCB* decrease more than Islamic banks. However, since the results from the response of loans show insignificant differences, the different response of *NCB* across bank types may be driven by various switching on other banks' assets portfolio besides loans.

Table 2.5.4(a) Estimation results of net-borrowing from the central bank (*NCB*) in Sample1

	Sample1							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Rhigh X Dummy NI	-1.067	-	-0.826	-	-0.558	-	-0.579	-
	(1.122)		(1.139)		(0.742)		(0.737)	
R X Dummy NI	-	-0.321	-	-0.212	-	0.523	-	0.280
		(0.721)		(0.831)		(0.592)		(0.572)
LAR	0.570***	0.572***	0.565***	0.566***	0.572***	0.572***	0.565***	0.566***
	(0.054)	(0.054)	(0.055)	(0.055)	(0.054)	(0.054)	(0.055)	(0.055)
CAR	-0.022	-0.023	-0.023	-0.023	-0.024	-0.024	-0.023	-0.023
	(0.021)	(0.021)	(0.022)	(0.022)	(0.022)	(0.022)	(0.022)	(0.022)
Cash+Netintbank+securities/	0.617***	0.618***	0.610***	0.611***	0.614***	0.618***	0.610***	0.611***
Total assets	(0.048)	(0.049)	(0.050)	(0.050)	(0.049)	(0.049)	(0.050)	(0.050)
LLP	-0.437***	-0.439***	-0.435***	-0.434***	-0.439***	-0.432***	-0.433***	-0.430***
	(0.055)	(0.054)	(0.056)	(0.057)	(0.055)	(0.055)	(0.057)	(0.057)
Rloans	-0.044	-0.059	-0.069	-0.071	-0.049	-0.045	-0.065	-0.066
	(0.137)	(0.140)	(0.150)	(0.148)	(0.141)	(0.141)	(0.148)	(0.149)
Rdep	0.065	0.012	0.011	0.013	0.032	0.004	0.006	0.007
	(0.156)	(0.151)	(0.158)	(0.158)	(0.162)	(0.154)	(0.162)	(0.160)
Market Share	0.158	0.223	0.229	0.230	0.215	0.243	0.239	0.244
	(0.422)	(0.393)	(0.400)	(0.400)	(0.416)	(0.402)	(0.408)	(0.406)
Rhigh or R[a)]	1.014	0.634	-	-	0.275	0.053	-	-
	(1.065)	(0.711)			(0.674)	(0.537)		
Time effects	No	No	Yes	Yes	No	No	Yes	Yes
Group time trends	No	No	No	No	Yes	Yes	Yes	Yes
Observations	8,263	8,263	8,263	8,263	8,263	8,263	8,263	8,263
R-squared	0.537	0.538	0.545	0.545	0.538	0.539	0.546	0.545

Notes: Within group estimation. Clustered standard errors in parentheses. Coefficient that are significantly different from zero at the 1%, 5% and 10% level are marked with ***, **, and * respectively. All estimations include a constant term and NI dummy. Rhigh is a dummy variable for policy rate > 6.5% and R is the level of policy rate. LAR, CAR, KAR, and LLP are ratio of loans, equity, cash, net-interbank placements and loss provisions to total assets, respectively. Market Share is share of individual assets to total assets of industry. Sample1 consists of all banks. a) Rhigh for columns (1) and (5), R for columns (2) and (6).

Table 2.5.4(b) Estimation results of net-borrowing from the central bank (*NCB*) in Sample2 and Sample3

	Sample2				Sample3			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Rhigh X Dummy NI	-2.056	-	-2.565*	-	-1.291	-	-1.891	-
	(1.384)		(1.385)		(1.239)		(1.262)	
R X Dummy NI	-	-1.961	-	-2.925*	-	-1.354	-	-2.278*
		(1.325)		(1.520)		(1.120)		(1.267)
LAR	0.763***	0.771***	0.758***	0.767***	0.678***	0.683***	0.665***	0.674***
	(0.047)	(0.045)	(0.048)	(0.044)	(0.052)	(0.050)	(0.052)	(0.049)
CAR	-0.007	-0.007	-0.006	-0.007	-0.011	-0.011	-0.011	-0.010
	(0.015)	(0.015)	(0.016)	(0.016)	(0.018)	(0.019)	(0.020)	(0.020)
Cash+Netintbank+securities/	0.646***	0.650***	0.637***	0.640***	0.565***	0.567***	0.550***	0.554***
Total assets	(0.045)	(0.043)	(0.046)	(0.044)	(0.049)	(0.047)	(0.050)	(0.049)
LLP	-0.482***	-0.487***	-0.485***	-0.488***	-0.430***	-0.433***	-0.422***	-0.424***
	(0.039)	(0.038)	(0.042)	(0.040)	(0.046)	(0.047)	(0.051)	(0.050)
Rloans	-0.238*	-0.219	-0.276*	-0.252*	-0.224	-0.209	-0.250	-0.232
	(0.140)	(0.146)	(0.152)	(0.152)	(0.143)	(0.155)	(0.159)	(0.158)
Rdep	0.830***	0.713***	0.758***	0.749***	0.836***	0.635***	0.734***	0.740***
	(0.193)	(0.201)	(0.218)	(0.208)	(0.205)	(0.239)	(0.274)	(0.262)
Market Share	0.420	0.537	0.452	0.536	1.743	2.176	2.136	2.362
	(0.393)	(0.408)	(0.402)	(0.420)	(1.453)	(1.491)	(1.462)	(1.513)
Rhigh or R[a)]	1.366	1.940	-	-	0.978	1.680	-	-
	(1.222)	(1.277)			(1.001)	(1.043)		
Time effects	No	No	Yes	Yes	No	No	Yes	Yes
Group time trends	No	No	No	No	No	No	No	No
Observations	6,880	6,880	6,880	6,880	5,072	5,072	5,072	5,072
R-squared	0.657	0.658	0.664	0.667	0.594	0.597	0.610	0.614

Notes: Within group estimation. Clustered standard errors in parentheses. Coefficient that are significantly different from zero at the 1%, 5% and 10% level are marked with ***, **, and * respectively. All estimations include a constant term and NI dummy. Rhigh is a dummy variable for policy rate > 6.5% and R is the level of policy rate. LAR, CAR, KAR, and LLP are ratio of loans, equity, cash, net-interbank placements and loss provisions to total assets, respectively. Market Share is share of individual assets to total assets of industry. Sample3 is Sample2 excluding government banks. a) Rhigh for columns (1) and (5), R for columns (2) and (6).

2.5.3 Discussion

Generally, we find that the theoretical framework predictions are mostly supported by the empirical results except for the response of loans to monetary policy. These significant differences across responses of non-Islamic and Islamic banks are more apparent when we exclude Islamic windows from the sample sets. Therefore, we could infer that the responses of Islamic windows to monetary policy are not significantly different from the responses of non-Islamic banks.

These no-difference results of Islamic windows may have originated by the failure of the type-for-type assumption, which requires each agent to only deals with agent of the same type. In the case of Islamic windows where the two types of banks are closely inter-correlated to each other, there could be arbitrage opportunities across types which could impede the potential differences, since in this case it is very possible that they share their customer base. Though this does not exclude Islamic full-fledge banks from having the same association with non-Islamic customers, which may also cause failure of type-for-type assumption to some extent, yet the empirical results of this study implies that it is relatively limited than Islamic windows. Meanwhile, excluding government and regional banks from the sample set as an attempt to get more comparable banks on both types, do not deliver much change in the results, implying that the significant differences of Islamic full-fledge banks to non-Islamic banks are robust across sample sets.

In accordance with the theoretical framework, the transmission goes from the policy rate to bank loans through demand for loans at the prevailing rate of return on loans. This channel seems to be relatively ineffective for an inelastic loans demand, as reflected by the statistically insignificant role of the loans rate in affecting the bank loans explained above. In addition to the possible violation of the type-for-type assumption, even if the particular assumption was not violated, different functions of demand for loans across firm types may also contribute to the no-difference results in the responses of loans to monetary policy. Arguably, Islamic banks' borrowing may differ from non-Islamic banks' borrowing due to religious motives, which may lead to different elasticity in the loans rate. Baele *et al.* (2014)

propound a similar idea, albeit from a different point of view, which finds that the default rate of Islamic loans is lower than conventional loans for the Pakistan case.

Another aspect from the theoretical point of view is that the no-difference results across Islamic and non-Islamic banks in Sample1 could also come from the fact that Islamic windows might simply maintain a higher capital buffer to restore the maturity-match condition in (3.17).[68] Indeed, the data demonstrates that, on average, the composition of time deposits to total deposits, *TDD*, which may reflect the ratio of patient to impatient households of the two bank groups, are fairly similar when Islamic windows are not excluded from the sample. In terms of the theoretical framework, it simply implies that $\left(1-\rho^{I}\right)=\left(1-\rho^{NI}\right)$. Thus, the inclusion of capital as a control variable, fails to deliver any differences in the results when the framework is calibrated using the data of loan-to-asset ratio *LAR*. On the other hand, when we only consider Islamic full-fledge banks, the differences to non-Islamic banks are apparent since the data of *LAR* and *TDD* also show significant differences, and in support for the theoretical framework. This is also supported by the fact that Islamic full-fledged banks do not significantly maintain different capital buffer than non-Islamic banks.

2.6 Conclusions

This study tries to compare the effectiveness of monetary policy that works through central bank standing facilities in two types of banks, Islamic and non-Islamic banks. Based on the theoretical framework, different banks' assets portfolios would lead to different responses to changes in the central bank's policy rate. In particular, monetary transmission would be less effective on Islamic banks, which have limited portfolio choices and thus hold more loans, than their conventional counterparts.

Initially, empirical works show that in general there is no-difference in responses of the two types of banks to the central bank policy rate, suggesting similar monetary transmission effectiveness. However, when we exclude Islamic windows from the sample,

[68] Not taken into account any default risks since the theoretical model abstracts from it.

the potential difference that the theoretical framework predicts are apparent and statistically significant. The ultimate results show that monetary policy is transmitted more strongly via non-Islamic banks than via Islamic full-fledge banks, except for level of loans in which both types show similar responses. These changes demonstrate how the results are highly dependent on how well the two types of banks are segregated from each other. The possibility that both types of banks are sharing their customer base generates arbitrage opportunities that drive prices toward equality across types, may cause similarity.

As for the policy implications, the stricter is the separation between Islamic and non – Islamic banks, the more apparent is the difference in effectiveness of monetary policy via both types of banks where non-Islamic banks potentially provide stronger channel. In general, the transmission works better in affecting deposit rates than through loans rates and bank' loans. The inelastic demands for loans together with considerably high excess reserves dampen the monetary transmission on both types of banks through the particular channel of this study.

Appendix 2

Appendix 2.1 Islamic Contracts[69]

bay' al-salam: Sale in which payment is made in advance by the buyer and the delivery of the goods is deferred by the seller.

bay' bithaman ajil: Sales contract where payment is made in instalments after delivery of goods. Sale could be for long term and there is no obligation to disclose profit margins.

ijarah: Leasing contract which is the sale of usufruct of an asset. The lessor retains the ownership of the asset with all the rights and the responsibilities that go with the ownership.

istisnah': A contract whereby manufacturer (contractor) agree to produce (build) and deliver well-described products (or premises) at a given price on a given date in the future. The price need not be paid in advance and may be paid in instalments in step with the preferences of the parties, or partly at the front end and the balance later on, as agreed.

ju'alah: Contract to perform a given task for a prescribed fee in a given period.

mudarabah: Contract between two parties – a capital owner or financier and an investment manager. Profit is distributed between the two parties in accordance with the ratio upon which they agree at the time of the contract. Financial loss is borne only by the financier. The investment manager's loss lies in not getting any reward for his services.

murabahah: Sale at a specified profit margin. This term, however, is now used to refer to a sale agreement whereby the seller purchases the goods desired by the buyer and sells them at an agreed marked-up price, the payment being settled within an agreed time frame, either in instalments or as a lump sum. The seller bears the risk for the goods until they have been delivered to the buyer.

musyarakah: Partnership. Similar to *mudarabah* contract, the difference being that here both partners participate in the management and the provision of capital and share in the profit and loss. Profits are distributed between the partners in accordance with the ratios initially set, whereas loss is distributed in proportion to each one's share in the capital.

wakalah: Contract of agency in which one person appoints someone else to perform a certain task on his behalf, usually for fixed fee.

[69] From: Askari, H., Z. Iqbal, N. Lrichene and A. Mirakhor (2010), *The Stability of Islamic Finance: Creating a Resilient Financial Environment for a Secure Future*. John Wiley & Sons (Asia), Singapore.

Appendix 2.2 The Government Budget Constraint

Following the analysis in the framework, we consider an equilibrium in which households put all of their endowment as bank deposits. The market clearing condition for consumption goods market where government expenditures G is assumed to do not affect households' consumption bundle choice:

$$\sum_i pc_1^i + \sum_i pc_2^i + G + \sum_i K^i + \sum_i \overline{B}^i = \sum_i py^i + \sum_i i_L^i K^i + \sum_i i_G^i \overline{B}^i \qquad \text{(A1)}$$

Substituting i_L^i and i_G^i for i_{CB} the non-arbitrage condition in (3.13) with $K^i = \alpha^i(1-\gamma+\gamma\delta^i)H^i$ and $\overline{B}^i = (1-\alpha^i)(1-\gamma+\gamma\delta^i)H^i$ as bank portfolio, we have the government budget constraint:

$$G = \sum_i (\gamma H^i - M^i)(i_{CB} - 1) \qquad \text{(A2)}$$

Appendix 2.3 Unit-root and Cointegration tests

Table A2.1 Im-Pesaran-Shin Unit-root tests (all banks)

Variables	without trend		with trend	
	Z-t-tilde-bar	p-value	Z-t-tilde-bar	p-value
Rloans	7.9239	1.000	-5.5595	0.000
Rdep	-0.0129	0.495	-10.0886	0.000
Lloans	2.9515	0.998	-6.8068	0.000
NCB	-16.875	0.000	-22.7792	0.000

Table A2.2 Cointegration tests (all banks)

Dependent variables	Independent variables	EC[1)]
Lloans	R	-0.0902***
	Lequity	(0.0205)
	Lcash	
	Lintbanka	
	Lintbankp	
	Lsecurities	
	NCB	
	Rloans	
	Market share	
Rloans	R	-0.0801***
	LAR	(0.0145)
	CAR	
	KAR	
	NIB	
	LLP	
	NCB	
	Market share	
Rdep	R	-0.204**
	LAR	(0.0892)
	CAR	
	KAR	
	NIB	
	LLP	
	NCB	
	Rloans	
	Market share	

Notes: Dynamic Fixed Effect regression. Clustered standard error in parentheses. Coefficient that are significantly different from zero at the 1%, 5% and 10% level are marked with ***, **, and *.
1) Error correction terms

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